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OF

NEW SOUTH WALES

Issued by direction of

The Hon. E. H. GRAHAM, M.L.A.
Minister for Agriculture

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K. SYNNOTT, *Editor*
O. G. FERNS, *Sub-editor*

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Editorial and Advertising Offices:
Department of Agriculture
Farrer Place
Sydney
Telephone: B06 Extn. 2812 *Postal Address:* Box 36A, G.P.O.

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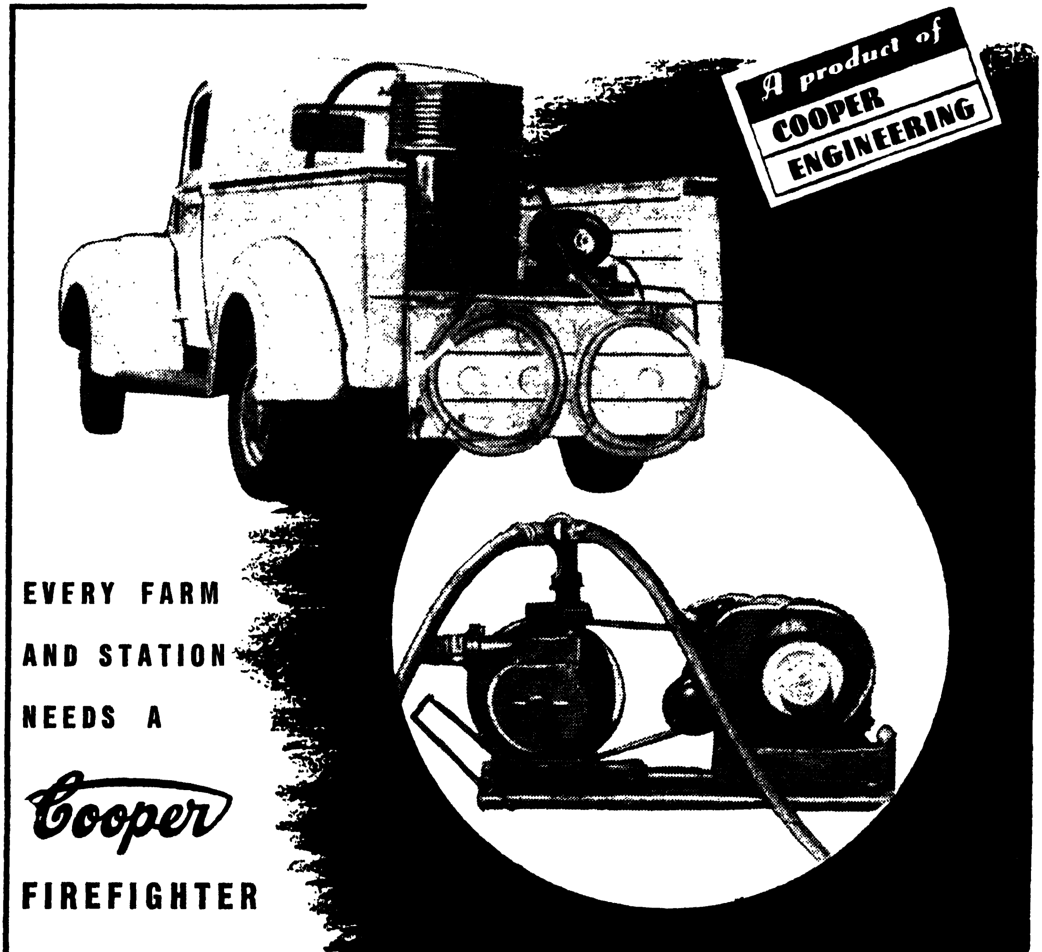

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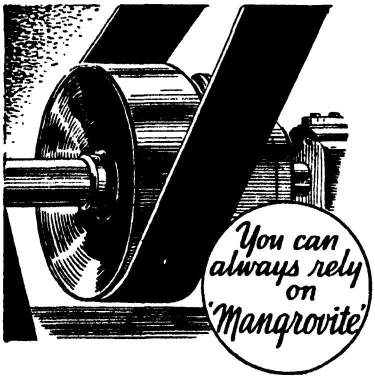

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Season's Greetings from the Minister for Agriculture Hon. E. H. Graham, M.L.A.

ONCE again it is my happy privilege as New South Wales Minister for Agriculture to extend to primary producers and all others engaged in our agricultural industries my best wishes for the festive season.

Seasonal conditions during the past year have, fortunately, been fairly satisfactory and, generally speaking, primary producers have enjoyed reasonably good returns for their labours, both in regard to quality of production and in prices realised for their produce.

In contrast with conditions prevailing in many overseas countries, I think it can be truly said that we, in Australia, to-day are enjoying a standard of living unsurpassed anywhere in the world.

This is due in a very large measure to the magnificent efforts of all those engaged in our agricultural industries. As a result of their hard work, food shortages in this country are practically unknown. Not only have our primary producers been able to satisfy all our own demands for foodstuffs, but they have contributed substantially to the well-being of peoples in other countries where hunger and food rationing are very severe.

H930H

Hon. E. H. Graham, M.L.A., Minister for Agriculture.

I think that New South Wales primary producers and everyone else engaged in the production of food can feel proud of their achievements during the past year, and I sincerely hope that 1949 will continue to bring prosperity to them and to our agricultural industries.

The officers of my Department join with me in extending the compliments of the season to primary producers throughout New South Wales, and we look forward to a continuation of the happy relationships which existed during the past year.

E H Graham

Agricultural College to be Established at Wagga.

"APPROVAL has been given to my proposals for the establishment of an Agricultural College at Wagga Experiment Farm, and the first course under the new arrangement will begin early in February."

Making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), said that the new Agricultural College would provide a complete three-year Diploma Course in Agriculture equal in all respects to the Hawkesbury Diploma Course in Agriculture, which was already famous throughout the world. This expansion in agricultural training facilities would not only give primary industry the benefit of highly-trained and competent young men, but would also serve a useful purpose in providing skilled staff for the Department of Agriculture.

"Wagga is ideally situated for investigational and educational purposes in relation to agriculture, as it is located in the centre of the southern wheat and sheep country and is close to the higher rainfall areas where other and more diverse forms of agriculture are possible," said Mr. Graham. "For this reason the Government decided that the new Agricultural College should be established at Wagga.

"It is not proposed that the Wagga Agricultural College should have any relation to the Hawkesbury Agricultural College in so far as administrative control is concerned, but the curriculum will be based largely on that provided for Hawkesbury Diploma Students," continued the Minister. "The Hawkesbury Diploma in Agriculture is renowned throughout the world, and the Wagga course, as I have already said, will be equivalent in all respects to the Hawkesbury Diploma Course.

"The establishment of the new Agricultural College at Wagga does not mean that the experiment work at Wagga Experiment Farm will in any way be curtailed. On the contrary, the institution will become a combined and complete unit for agricultural research and agricultural training and education. The research aspect of the Wagga Experiment Farm's activities will soon be enhanced by the establishment of a Wheat Research Institute."

Winter Wheat for Australian Conditions.

"DEPARTMENTAL plant breeders are developing a winter wheat for use under Australian conditions." Making this statement, the Minister for Agriculture, Mr. Graham, said that winter wheats were not grown at present by Australian farmers. During our relatively mild winters they planted what was really a spring wheat.

"A winter wheat," explained the Minister, "is one which requires a definite amount of low temperature before it can commence to ear. This type of wheat, though early maturing, can be sown earlier in the autumn than present varieties. There is also much less danger of such a variety being damaged by cold, which in 1947 alone reduced the New South Wales crop by 1½ million bushels.

Such a winter wheat, the Minister said, had been discovered several years ago, but, unfortunately, it had been susceptible to stem rust and its baking quality had not been up to the high standard of new varieties more recently released. Already, however, plant breeders of the Department had added disease resistance and higher baking quality to this wheat, but it might still be several years before seed of such wheats could be made available to growers.

VARIETIES OF WHEAT RECOMMENDED for 1949 Sowing.

With Recommendations for Temporary Pasture Mixtures.

THE main features of the recommendations by the Standing Advisory Committee on Wheat, of varieties for 1949 sowing, are a further extension since last year of the zones for which the recently-produced rust-resistant varieties are recommended, and the inclusion of an additional variety—Quadrat—for the Riverina.

Because of the damage caused by stem rust to the 1947-48 wheat crop, the Standing Committee decided to recommend for 1948 sowing, in a large portion of the wheat belt, the rust-resistant varieties, Celebration, Charter, Gabo, Kendee and Yalta. This recommendation has been fully justified. Although harsher conditions prevailed than in 1947 and frost damage was severe, yields generally were very satisfactory except in some instances in which the new varieties did not fully measure up to expectations. Of the new wheats, Gabo has been outstanding, while Kendee has also shown to advantage. A major yield-reducing factor was the extensive damage due to cold injury. In part this can be attributed to sowing varieties out of season.

In contrast to 1947-48, the wheat crops for the 1948-49 season have been remarkably free of rust. The wheat ripened quickly, with a tendency to hay off, and harvesting conditions have been such as to favour the garnering of a particularly good quality grain. No doubt the increasing popularity of wheats of better milling and baking quality was partly responsible for the improvement which has taken place.

Seed of the rust-resistant varieties is in plentiful supply. These wheats were grown extensively in 1948 and it is probable that increased sowings will be made in 1949. By the time these results become known, very complete data will be available on which to base future recommendations.

Hay Varieties.

No hay variety recommendations have been made for specific zones. The reason for this is that in northern and western districts few farmers grow large areas especially for hay. They rely largely on grain varieties suitable for hay, and cut where the crop is heaviest, to meet their needs. The outstanding varieties for hay are Zealand for early sowing and Baroota Wonder for early to mid-season sowing dependent on district conditions. Neither of these wheats is a good dual purpose variety. The grain yield is relatively poor, and grain quality unsatisfactory. For northern districts it is advisable to rely on Ford, Kendee and Charter for hay. For western districts and the Western Riverina, Baroota Wonder can be relied upon to produce a heavy yield of prime quality hay, whilst in the better rainfall belt of the Eastern Riverina, Zealand is an excellent hay variety for early sowing.

Varieties No Longer Recommended.

Varieties deleted from the recommendations are: Pusa 4, Fedweb 1, Bungulla and Ghurka, whilst Gular and Waratah are now recommended for only one zone. These varieties may still find favour with a limited number of growers to meet special conditions. However, it is considered that as they have been grown for more than a few years and their popularity is waning, further recommendation is not warranted. Moreover, the varieties which have been recommended are superior in point of yield and disease resistance, and in most instances grain quality is better.

Pusa 4 is renowned for its high grain quality and is in demand for blending and manufacture of special types of flour. When grown in suitable districts it is essentially a premium wheat, and as such could be grown under contract to millers who require this type of grain. By comparison, Pusa 4 is inferior in yield to Gabo, which variety is rust-resistant and produces a grain of excellent quality from the bakers' point of view.

Fedweb 1, a stem rust resistant, but leaf-rust susceptible, late-maturing variety never very widely grown is losing in popularity.

Bungulla, very similar to Bencubbin, but of earlier maturity and low grain quality can, in most districts, be replaced by Gabo.

Quadrat is recommended in preference to Ghurka for early sowing, though the grain quality is far from satisfactory.

Gabo is likely to take the place of Gular. For yield and resistance to rust it is superior, and the grain quality, if not equal, is not significantly inferior.

Time of Sowing.

The time of sowing is particularly important, perhaps more so to-day with modern farming equipment, when large areas can be seeded in a matter of a few days, and also because the one-time, later-maturing varieties have been replaced with wheats having a shorter growing season. Moreover, some of the newer varieties, though more resistant to disease, are susceptible to cold injury.

Varieties are classified as suitable for:—Early sowing, mid-season sowing, or late sowing in relation to the normal range of sowing dates for the district. These terms should be regarded as relative, and used only as a guide. Some varieties fall in between these classes. As an example. Celebration may do better in some localities if sown mid-season. This applies to portion of the north-west and irrigated crops on the Murrumbidgee Irrigation Area. In the cooler districts, a quick-maturing wheat (one sown late), if sown too late, fails to make satisfactory growth, because the winter conditions are too severe.

Late- or slow-maturing varieties should be sown early—second and third week in April. Varieties included in this group are Quadrat, Bordan, Ford and Celebration in order of maturity.

Mid-season varieties are mainly sown from the end of April to mid-May. The varieties are Bencubbin, Kendee and Yalta.

Early- or quick-maturing varieties should be sown later—mid-May to early June. Varieties included in this group are Waratah, Charter, Koala, Gabo, Ranee and Gular.

The sowing dates are only approximate and may be extended either way, depending on both soil and climatic conditions. In the north-west June sowings of quick-maturing wheats, grown on heavy fertile soils is sound practice, whereas in the drier western and south-western wheat areas, if rain falls early in the growing season, it is usually safer to risk sowing a little on the early side. The greatest danger is from frost damage. District Agronomists, who are located throughtout the State can furnish specific information as regards the optimum sowing dates for each zone.

For the State only fourteen varieties are recommended. The principal varieties are Gabo, Kendee, Celebration, Ford, Bencubbin, Bordan, Charter and Koala.

Varieties Recommended for Grain.

NORTHERN WHEAT BELT.

Zone 1: Northern Tableland.

(Armidale, Glen Innes.)

Mid-season sowing—Ford, Celebration.
Late Sowing—Kendee, Yalta, Gabo, Charter.

Zone 2: North-western Slopes.

(Warilda, Delungra, Inverell, Bingara, Barraba, Attunga, Tamworth, Quirindi and Upper Hunter districts.)

Early Sowing—Celebration, Bordan (for Upper Hunter only).
Mid-season Sowing—Yalta, Kendee.
Late Sowing—Charter, Gabo.

Zone 3: North-western Slopes—Western Portion.

(Manilla, Somerton, Curlewis, Gunnedah, Boggabri, Mullaley, Tambar Springs.)

Early Sowing—Ford, Celebration.
Mid-season Sowing—Yalta, Kendee.
Late Sowing—Charter, Gabo.

Zone 4: North-western Plains.

(Boggabilla, Garah, Gravesend, Pallamallawa, Bellata, Narrabri, Baan Baa, Wee Waa, Pilliga, Baradine, Coonamble.)

Early Sowing—Celebration, Ford.
Mid-season Sowing—Yalta, Kendee. Bencubbin for Pilliga, Coonamble and Baradine only.
Late Sowing—Charter and Gabo.

CENTRAL WHEAT BELT.

Zone 5: Central Tableland.

(Bathurst to Orange districts.)

Mid-season Sowing—Bordan, Ford, Celebration.
Late Sowing—Kendee, Gabo.

Zone 6: Central-western Slopes—North-eastern Portion.

(Coonabarabran, Binnaway, Mendooran, Leadville, Coolah, Dunedoo, Gulgong, Mudgee, Wellington, Geurie.)

Early Sowing—Ford, Bordan, Celebration.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo.

Zone 7: Central-Western Slopes—Central-eastern Portion.

(Molong, Manildra, Cumnock, Cudal, Cargo.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo.

Zone 8: Central-western Slopes—South-eastern Portion.

(Cowra, Canowindra, Eugowra, Goolagong, Koorawatha, Greenethorpe, Grenfell.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo, Koala.

Zone 9: Central-western Slopes—North-western Portion.

(Tooraweenah, Gulargambone, Gilgandra, Eumungerie, Dubbo, Wongarbon.)

Early Sowing—Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee, Yalta.
Late Sowing—Gabo, Charter, Koala.

Zone 10: Central-western Slopes—South-western Portion.

(Parkes, Forbes, Bogan Gate, Peak Hill, Trundle.)

Early Sowing—Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee, Yalta.
Late Sowing—Gabo, Koala.

Zone 11: Central-western Plains—Northern Portion.

(Albert, Tottenham, Trangie, Narromine, Condobolin, Euabalong, Tomingley.)

Early Sowing—Bencubbin, Kendee, Yalta.
Mid-season Sowing—Gular, Gabo, Charter, Koala.

Zone 12: Central-western Plains—Northern Portion.

(Cargelligo, Tullibigeal, Hillston, Merriwagga, Weethalle, Rankin's Springs, Yenda, Griffith.)

Early Sowing—Bencubbin, Kendee, Yalta.
Mid-season Sowing—Gabo Charter.

SOUTHERN WHEAT BELT.

Zone 13: Southern Tableland.

(Goulburn, Yass, Federal Territory.)

Mid-season Sowing—Bordan, Ford, Celebration.
Late Sowing—Kendee, Gabo.

Zone 14: South-western Slopes—Eastern Portion.

(Young, Boorowa, Cootamundra, Stockinbingal, Bendick Murrell, Murrumburrah, Wallendbeen.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee, Yalta.
Late Sowing—Gabo, Koala.

Zone 15: South-western Slopes—Central Portion.

(Bribbaree, Quandialla, Caragabal, Temora, Ariah Park, Barmedman.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee, Yalta.
Late Sowing—Gabo, Koala.

Zone 16: South-western Slopes—Western Portion.

(Wyalong, Ungarie, Barellan, Ardlethan, Tallimba.)

Early Sowing—Ford, Celebration,
Mid-season Sowing—Bencubbin, Kendee, Yalta.
Late Sowing—Gabo, Charter.

Zone 17: North-eastern Riverina.

(Junee, Marrar, Coolamon, Wagga, Uranquinty, The Rock, Milbrulong, Lockhart.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo, Koala.

Zone 18: South-eastern Riverina.

(Yerong Creek, Henty, Pleasant Hills, Culcairn, Holbrook, Walbundry, Walla Walla, Gerogery, Jindera, Albury, Tumbarumba, Brocklesby, Balldale, Corowa.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo, Waratah.

Zone 19: North-central Riverina.

(Ganmain, Grong Grong, Narrandera, Darlington Point, Boree Creek, Urana.)

Early Sowing—Celebration, Ford.
Mid-season Sowing—Bencubbin, Kendee.
Late Sowing—Gabo, Charter.

Zone 20: South-central Riverina.

(Rand, Daysdale, Oaklands, Jerilderie, Berrigan, Finley, Tocumwal, Mulwala.)

Early Sowing—Celebration, Quadrat.
Mid-season Sowing—Ranee, Bencubbin, Kendee.
Late Sowing—Gabo, Charter.

Zone 21: Western Riverina.

(Deniliquin, Mathoura, Moama.)

Early Sowing—Quadrat, Bencubbin, Kendee.
Mid-season Sowing—Ranee, Gabo, Charter.

Zone 22: Far-western Riverina.

(Moulamein, Balranald, Euston.)

Early Sowing—Bencubbin, Ranee.
Mid-season Sowing—Gabo.

Zone 23: Murrumbidgee Irrigation Area

(On irrigated areas.)

Early Sowing—Bordan, Ford, Celebration.
Mid-season Sowing—Kendee, Yalta.
Late Sowing—Gabo.

COASTAL DISTRICTS.

Early Sowing Only—Ford, Celebration, Kendee.

Early Maturing Varieties for Hay or Green Fodder—Charter, Florence, Gabo.


MAP OF NEW SOUTH WALES
SOUTH PACIFIC OCEAN
TASMAN SEA
QUEENSLAND
VICTORIA
STATE OF SOUTH AUSTRALIA
STATE OF

Notes on Recommended and Grown Wheat Varieties.

The following descriptions of recommended varieties and those likely to be grown are given as a guide to farmers in the choice of the best varieties of wheat for their conditions. Varieties recommended by the Standing Advisory Committee are marked with an asterisk.

**Baroota Wonder.*—Essentially a hay wheat of excellent quality and yield, suitable for mid-season sowing. This is a useful variety for sowing on the headlands which are usually cut for hay. To avoid haymaking clashing with the grain harvest, it should not be sown too late. The growth is moderately tall with heavy weighing stems which cure to a desirable green colour. The variety is slightly resistant to flag smut but susceptible to stem rust, and therefore should not be grown in north-west districts.

**Bencubbin.*—The most popular variety in New South Wales, comprising over 40 per cent. of the area sown. In the drier districts this variety has proved outstanding from the point of view of yield. It possesses a number of undesirable features; foremost among these are straw weakness, relatively poor grain quality and susceptibility to stem rust. Has high resistance to flag smut. The grain bleaches fairly readily. Although classed as a weak flour wheat, when grown under favourable conditions and on fertile soils, it matures a bright grain of moderately good flour quality. The part replacement of Bencubbin with varieties of better grain quality is desirable to assist maintain a good standard for New South Wales wheat.

**Bordan.*—A variety recommended for early sowing within favoured rainfall districts. It is tall growing and the straw is of good quality. Has some slight resistance to stem rust and is moderately resistant to flag smut. The grain is of the medium strength flour class, but may not measure up to this standard in the tableland districts. In many respects Bordan resembles Ford which it is replacing in districts of good rainfall, as it often has a high yielding capacity. However, it does not finish as well should late spring conditions be dry. For hay purposes it is not equal to Ford in quality.

Bungulla.—An early-maturing selection from Bencubbin, which variety it resembles in general characteristics, such as resistance to flag smut, straw weakness and flour quality. Though enjoying some measure of popularity, is considered suitable only for the drier districts where stem rust is not a major consideration.

**Celebration.*—This wheat, bred by the Department, from Double Cross x Dundee x Dundee, is of mid-season to late maturity, usually ripening earlier than Ford. Should not be sown too early on the heavy soils of the north-west or under irrigation on the rice land of the Murrumbidgee Irrigation Area. When sown out of season it is somewhat susceptible to stem frosting. Celebration is highly resistant to flag smut; also highly resistant to the prevalent races of stem rust. The straw is tall, and of fairly satisfactory strength. The ear is moderately long, tapering, smooth and brown in colour. It thrashes rather easily, and as the grain is held somewhat loosely in the ripe ear, it is predisposed to shattering. Stooling capacity is good, and in comparison with main crop varieties, Celebration returns a satisfactory yield.

The grain shows strong wheat characteristics, though not equal to Charter or Yalta. Gluten of Celebration lacks the extensibility or stretchiness of Ford.

**Charter.*—Charter is a cross between Kenya and Gular. In maturity this variety falls between mid-season and early. It is highly resistant to stem rust and flag smut. The straw is fine, medium tall, of only moderate strength, and is subject to lodging when grown on heavy soils. Appears to be highly susceptible to stem frosting, and for this reason sowing too early is to be avoided, and it should not be sown in localities subject to very severe frosts. Considered suitable as an early hay wheat, Charter may be classed as a strong or premium wheat, possessing some of the strength characters of Pusa, and is very useful for blending with weaker varieties.

Dundee.—At one time popular, but has been superseded by some of the newer varieties. It is productive, suitable for mid-season sowing having a moderately short straw of good strength. It is highly susceptible to stem rust, but has some resistance to flag smut. When sown out of season suffers from cold injury. Though classed as medium strong flour wheat, it frequently produces a mottled grain indicating a low protein content.

Eureka.—Prior to the breakdown in resistance to stem rust, this variety was largely grown in the north-west, but is no longer recommended on account of its susceptibility to disease. If not effected by rust it is a high yielding variety producing moderately strong grain of good quality.

Eureka 2.—Is similar to Eureka but a week later in maturing; has stronger straw and holds its grain better.

Fedweb 1.—A short, strong strawed variety, which is grown to some extent in the north-west, and is suitable for early sowing. It is highly resistant to stem rust, but susceptible to leaf rust, flag smut and septoria. The grain, which is held firmly, is in the medium strong flour class and is of good quality.

**Florence.*—Recommended only for coastal sowings. It is of very early maturity, has a tall slender straw and is moderately resistant to flag smut and stem rust with a high resistance to bunt. This variety shells very freely. The grain is hard and vitreous, and of good quality.

**Ford.*—At one time popular in the north-west, it has been largely superseded by the rust-resistant varieties. A tall-growing variety possessing straw of good quality which picks up and combs out well. It is suitable for hay purposes, the straw being of good colour and quality. Ford finishes better than most varieties, even though the late spring may be dry, and the grain does not bleach as readily as many other varieties. It has some

slight resistance to stem rust, and is not highly susceptible to flag smut.

Grown under favourable conditions, the flour produced from this variety is highly elastic, and is invaluable for use in a baker's strong blend for specialised bread manufacture.

**Gabo*.—This variety was bred at the Sydney University from a Bobin selection x Gaza x Bobin. During the past two seasons it has been grown extensively over many parts of the wheat belt, being highly productive. It is recommended for late planting, and should not be sown before the end of May or early June in the north-western districts. However, slightly earlier sowing is desirable in the drier western and south-western areas. On the Slopes, if sown too early, it is subject to stem frosting.

Gabo is highly resistant to the known races of stem rust, but recently has become susceptible to leaf rust. It does not appear to have a high degree of resistance to flag smut, and for this reason should not be grown on land which formerly grew a smutted crop. The straw is short and of moderate strength. It thrashes readily, and during the past season has shown a tendency to shatter. The grain is of moderate size, deeply creased and is lacking in a smooth, plump finish. From the bakers' point of view, Gabo's baking quality is excellent. Like Gular, it is one of the very few wheats which, when milled on its own, can be made into really satisfactory bread.

**Gular*.—Of early maturity, and susceptible to flag smut and stem rust. The grain is usually hard and vitreous, being a little inferior to Pusa 4 in baking quality. It is probable that Gabo will largely displace this variety.

**Kendee*.—This variety was bred by the Sydney University by crossing Dundee with Kenya. It is highly resistant to the prevalent races of stem rust, but is leaf-rust susceptible to the same degree as most of the commercial varieties. Has good resistance to flag smut. The straw is of moderate height and strong, and although the crop thrashes readily, the grain is held in the ripe ear satisfactorily; it is subject to stem frosting, and care should therefore, be taken not to sow too early in frost-liable localities.

Kendee has proved to be a highly productive variety, and is likely to be grown more extensively in the future.

The baking quality of Kendee is somewhat lower than that of Gular, and it has not the same degree of extensibility in its gluten. The grain is of moderate size, moderately deeply creased, and lacks a smooth plump finish; usually the bushel weight is not high.

**Koala*.—An early-maturing, moderately short and strong strawed variety which holds its grain satisfactorily. Possesses field characters which appeal to the farmer. It has not a high degree of resistance to disease, being only moderately resistant to flag smut and is highly susceptible to stem rust. The grain of Koala is attractive with a high bushel weight, but from the point of view of grain quality, it is only slightly superior to Bencubbin.

Pusa 4.—Though not now recommended for sowing in north-western districts, it still enjoys a measure of popularity, as good samples frequently command a high premium. Because of its susceptibility to stem rust, it is considered that farmers in general would be well advised to grow the rust-resistant varieties. The yield from Pusa is not particularly high except when grown on heavy fertile soils.

Pusa III.—A smooth chaff selection from Pusa 4, to which it is similar in all other characters.

**Quadrat*.—A cross between Ghurka and C.M.G. made in Victoria and is now the leading variety in that State, representing 47.2 per cent. of the area sown. Of late maturity, it is considered best suited for the heavy types of soil. It has a short, strong, erect straw, and is a brown chaff variety, free stripping and normally produces a well-filled grain. Measured by New South Wales standards, the grain quality is unsatisfactory.

Quadrat is susceptible to both stem and leaf rust, but resistant to flag smut. It is recommended only for districts not subject to rust and where in the past Ghurka has given good results.

**Rance*.—A mid-season to late-sowing wheat considered suitable only for the Western Riverina. It has a short, fine straw and is susceptible to flag smut and stem rust. Grain quality is unsatisfactory, and it is classed as a weak flour wheat.

**Waratah*.—At one time grown very extensively in New South Wales, Waratah is now sown only to a limited extent in southern districts. The straw is slender and tall, but picks up and combs well should the crop become lodged. The variety is susceptible to flag smut and rust. The grain is of a weak flour class which does not find favour with the millers.

**Yalta*.—A Kenya x Pusa 4 x Dundee cross produced by the Department. This is a main crop variety, having good resistance, though not immunity to the prevalent races of stem rust. It is leaf-rust susceptible to the same degree as most of the commercial varieties, but has a good resistance to flag smut. The straw is of moderate height and of satisfactory strength.

This variety does not possess a high degree of resistance to cold damage. The grain is moderately small with a shallow crease, plump, and when grown under favourable conditions, it is vitreous, and an attractive amber colour; the bushel weight is high. Yalta shows typical Pusa strength qualities and is especially useful for blending.

**Zealand*.—A late-maturing variety suitable for hay in districts of good rainfall where the danger of stem rust is slight. The straw is tall, white, medium strong and of excellent quality for hay. Has low resistance to disease.

The grain is large, soft and opaque and falls in the weak flour class. Is not recommended for grain.

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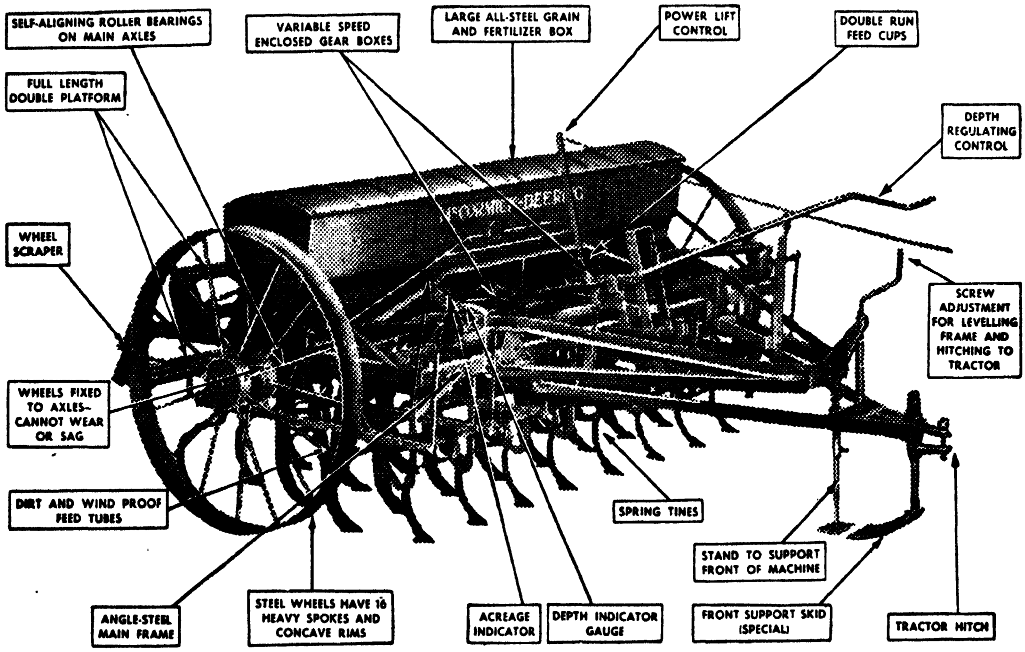

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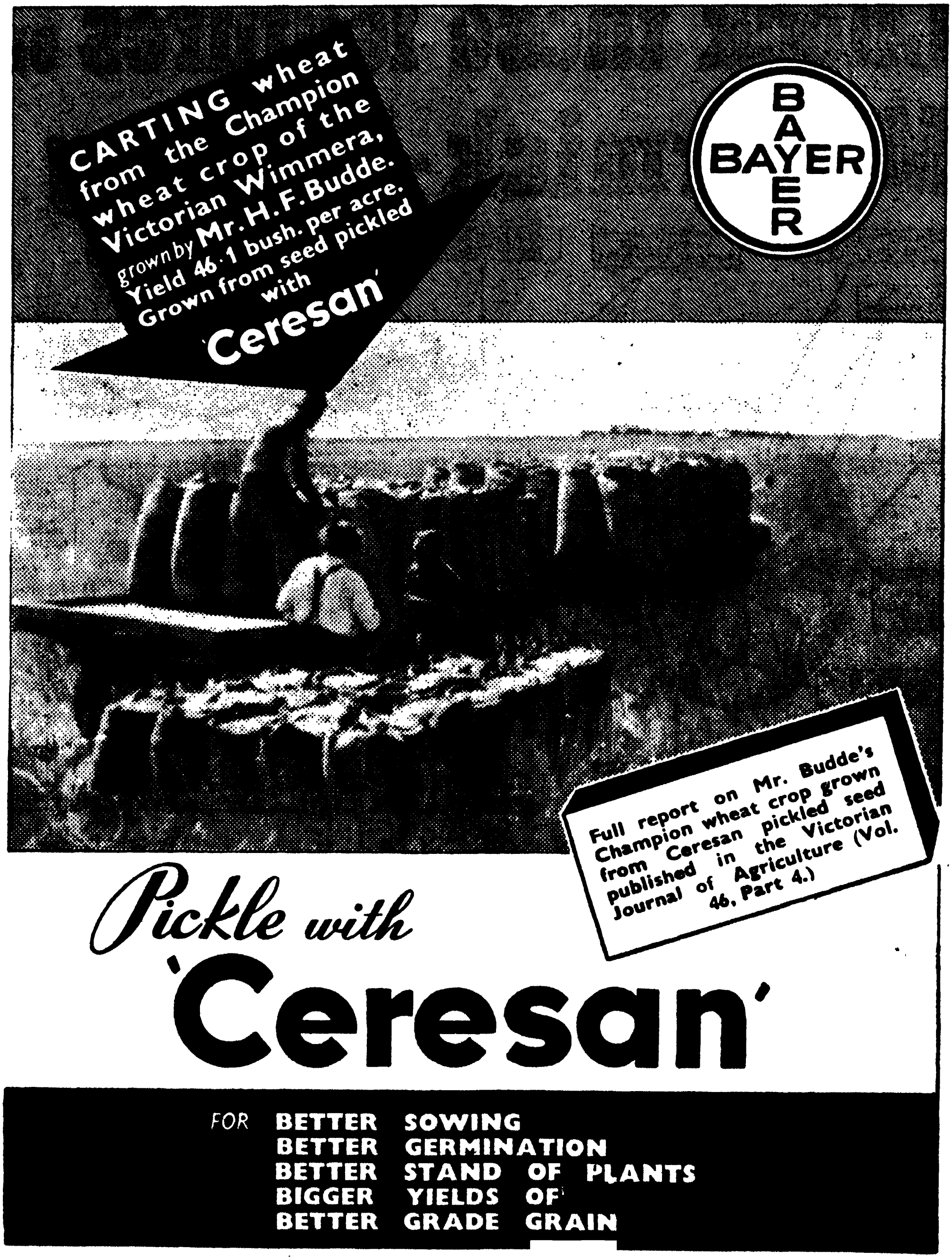
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TEMPORARY PASTURES IN THE WHEAT ROTATION.

J. N. WHITTET, H.D.A., Principal Agronomist (Pastures).

THE demand for increased quantities of animal products of all descriptions means that greater calls will be made on pasture and crop areas, and consequently, in addition to conducting good pasture management practices, an endeavour must be made to establish additional areas of sown pastures and grazing lucerne.

While the Department's pasture establishment investigations indicate that the most effective way of sowing pasture and lucerne is on well-worked fallows, using 1 cwt. of superphosphate per acre, many wheat-farmers sow their pasture plant seed at the same time as the last wheat crop in a rotation.

The seeding rate for wheat under these conditions should not exceed 45 lb. per acre (on soils which produce a rank growth use only 30 lb. per acre) in order to give the pasture plants a chance to become established and not be unduly crowded by the rapid growing cereal.

Should the spring be dry, the young pasture plants are likely to suffer, because the more robust rooting systems of the cereal plants will unfavourably compete with those of the pasture plants for soil moisture.

Where pasture seeding with a cereal is to be carried out, wheat is preferred to oats, as the latter crop crowds the pasture seedlings more than wheat plants.

The recommendations of pasture mixtures for the various wheat zones—as shown in the map on page 6—are as follows:—

Pasture Recommendations.

Wheat Zone No. 1.

Sow a mixture of Italian Rye 10 lb. and Red clover 4 lb. seed per acre; on heavy basaltic flats, add 2 lb. Black Medic (*Medicago lupulina*) seed to the mixture.

Wheat Zone No. 5.

In the higher rainfall sections of this district, sow Perennial Rye 5 lb., Wimmera Rye 1 lb., Subterranean clover (mid-season) 3 lb. and lucerne 2 lb. per acre on soils of good depth; where soils are shallow omit the lucerne from the mixture. In the lower rainfall section of the area (such as Bathurst) sow Wimmera Rye 1 lb., Subterranean clover (mid-season) 2 lb., Ball clover 1 lb. per acre; on soils of good depth add lucerne 2 lb. per acre to this mixture.

Wheat Zone No. 7.

Sow Wimmera Rye 1 lb. lucerne 3 lb., Subterranean clover (early strain) 1½lb. per acre in localities where soil types are heavy and rainfall is lower than in other sections of the area. On the lighter soils, substitute Subterranean clover (mid-season) 1½ lb. for the early strain in localities which experience a higher rainfall.

Wheat Zone No. 8.

Sow Wimmera Rye 1 lb., lucerne 3 lb., Subterranean clover (early strain) 1½ lb. per acre on soils of good depth; on soils too shallow for lucerne sow Wimmera Rye 2 lb. and Subterranean clover (early strain) 3 lb. per acre.

Wheat Zone No. 10.

On the heavier textured soils, sow Wimmera Rye 1 lb. per acre with the last wheat crop; Burr trefoil develops naturally on these soils. Where the soils are deep, and particularly where occasional flooding occurs, sow Wimmera Rye 1 lb. and lucerne 2 lb. per acre; in the eastern portion (Parkes) add Subterranean clover (early strain) 2 lb. to this mixture.

Wheat Zone No. 11.

In this area the heavy textured soils produce an abundant growth of Burr trefoil, and it is only necessary to include Wimmera Rye 1 lb. per acre. On the lighter textured soils sow Wimmera Rye 1 lb. and lucerne 2 lb. per acre.

Wheat Zone No. 13.

In the higher rainfall sections of this area Italian Rye 10 lb. and Red clover 4 lb. is a satisfactory mixture for a short term pasture of two years. Where a hardier mixture is required, sow Wimmera Rye 2 lb., Subterranean clover (mid-season strain) 3 lb., Ball clover 2 lb. per acre; on deep, well-drained soils add 1 lb. of lucerne seed to this mixture.

Wheat Zone No. 14.

Sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb. where soils are of good depth; on shallower country, use Wimmera Rye 3 lb. and Subterranean clover (mid-season strain) 3 lb. per acre.

Wheat Zone No. 15.

On the lighter soils east of Temora and in the Barmedman district, sow Wimmera Rye 1 lb. lucerne 1 lb., Ball clover 1 lb. per acre. On heavy soils sow Wimmera Rye 2 lb., Barrel clover 1 lb. per acre. Generally the heavy soils carry sufficient Burr trefoil seed to make the sowing of this species unnecessary. If Burr trefoil is insufficient, add 1 lb. per acre to the above mixture.

Wheat Zones Nos. 2, 3, 4, 6, 9, *and* 12.

Where soils are friable and deep use a mixture of Wimmera Rye 1 lb., lucerne 2 lb. and Burr trefoil 2 lb. per acre; on the heavier types of country, unsuitable for lucerne, sow Wimmera Rye 3 lb. and Burr trefoil 4 lb. per acre. In Zone 9 substitute for Burr trefoil 4 lb., a mixture of Burr trefoil 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. The lower rainfall sections of Zone No. 12 are too dry for lucerne and there the Wimmera Rye-Burr trefoil mixture should be sown.

Wheat Zones Nos. 17 *and* 18.

In the good rainfall sections sow Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (mid-season strain) 2 lb., Ball clover 1 lb., and Barrel clover 1 lb. per acre on soils of good depth; omit lucerne on the shallow soils. Use Subterranean clover (early strain) 2 lb., instead of Subterranean clover (mid-season strain), in the lower rainfall parts of both these zones.

Wheat Zone No. 19 *and the Eastern half of Zone No.* 20.

Use Wimmera Rye 1 lb., lucerne 2 lb., Subterranean clover (early strain) 2 lb., Ball clover 1 lb. and Barrel clover 1 lb. per acre on deep soils. In the case of shallow soils omit the lucerne and increase the Ball and Barrel clover seedings to 2 lb. each.

Wheat Zone No. 16 *and Western half of No.* 20.

Sow Wimmera Rye 2 lb., Ball clover 1 lb., Barrel clover 1 lb. per acre. In the better rainfall sections on deep soils lucerne 1 lb. can be added to the mixture. The lower rainfall sections of Zone 20 are too dry for lucerne.

Wheat Zones Nos. 21 *and* 22.

In these Zones sow Wimmera Rye 3 lb., and Burr trefoil 3 lb. per acre.

Irrigated Areas.

The most satisfactory method of establishing pastures on irrigated country is to sow the grass and clover seeds mixture on a correctly graded and well prepared seed bed, and not with a crop of wheat.

A suitable temporary pasture mixture for irrigated country would be:—

Wimmera Rye 3 lb., and Subterranean clover (mid-season strain) 3 lb. per acre.

General Notes.

Owing to the large amount of "hard" seed in Ball and Burr clovers, only scarified seed of these species should be sown.

One of the disadvantages of sowing lucerne with wheat, is that if the spring and early summer months turn in very dry, this legume is unlikely to become established satisfactorily when sown with a cover crop.

In heavier rainfall districts and under irrigation, other grasses and clovers such as *Phalaris tuberosa*, Perennial Rye, White clover, are suitable for the establishment of permanent pastures: these species, however, are too valuable to include in the wheat rotation as they would be approaching their maximum carrying capacity when wheat was to be sown again.

Any farmer requiring details of suitable permanent pasture mixtures for his country should write to this Department for recommendations, or contact the District Agronomist.

Further details covering pasture improvement operations will be found in the following publications which can be obtained, free of cost, from the Department of Agriculture, Sydney:—

Pasture Improvement in Northern Tableland Districts.

Pasture Improvement in Central and Southern Tableland Districts.

Pasture Improvement in the Slopes, Plains and Western Division.

Lucerne as Pasture in Western Districts.

Methods of Establishing Improved Pastures.

Methods and Machinery for Top-dressing Pastures.

Pasture Management.

Pasture Improvement on the Murrumbidgee Irrigation Area.

Irrigation Farming—With Special Reference to Wakool and Berriquin Irrigation Districts.

Pasmo Disease of Linseed.

First Occurrence in New South Wales.

SPECIMENS of diseased linseed plants from the Walla Walla district have been diagnosed by the Biological Branch of the Department as affected with pasmo disease, caused by the parasitic fungus *Sphaerella linorum*. This outbreak, which is reported to be general in the Walla Walla district, is the first record of occurrence of this serious disease in New South Wales.

The disease appeared for the first time in Victoria in 1940, in flax, and was fairly common last year in that State. It is considered most likely that the disease was carried to Walla Walla by wind-borne spores from Victoria.

Pasmo disease of linseed and flax is highly infectious and is also seed-borne. It has spread through most countries of the world where flax or linseed is grown. In addition to the crop plants it attacks wild flax. The disease causes a blighting and browning of foliage and stems, and in severe outbreaks flower buds and bolls may be blighted as well. Many of the lesions girdle the stem or leaves and many of the bolls fail to fill.

The appearance of this disease in New South Wales is regarded as most unfortunate, and is expected to increase the hazards of linseed production in the southern portion of the State. It may be possible to retard its spread to the northern areas by careful zoning of seed supplies.

Control of this disease in an area where it is established will depend on crop sanitation and crop rotation. The stubble should be burned soon after harvest and the residue ploughed in as soon as possible. If available, disease-free seed should be used for subsequent crops, as dusting of seed is only partially effective in killing adherent spores. If wild flax is present in the district it will lessen the chances of controlling the disease.

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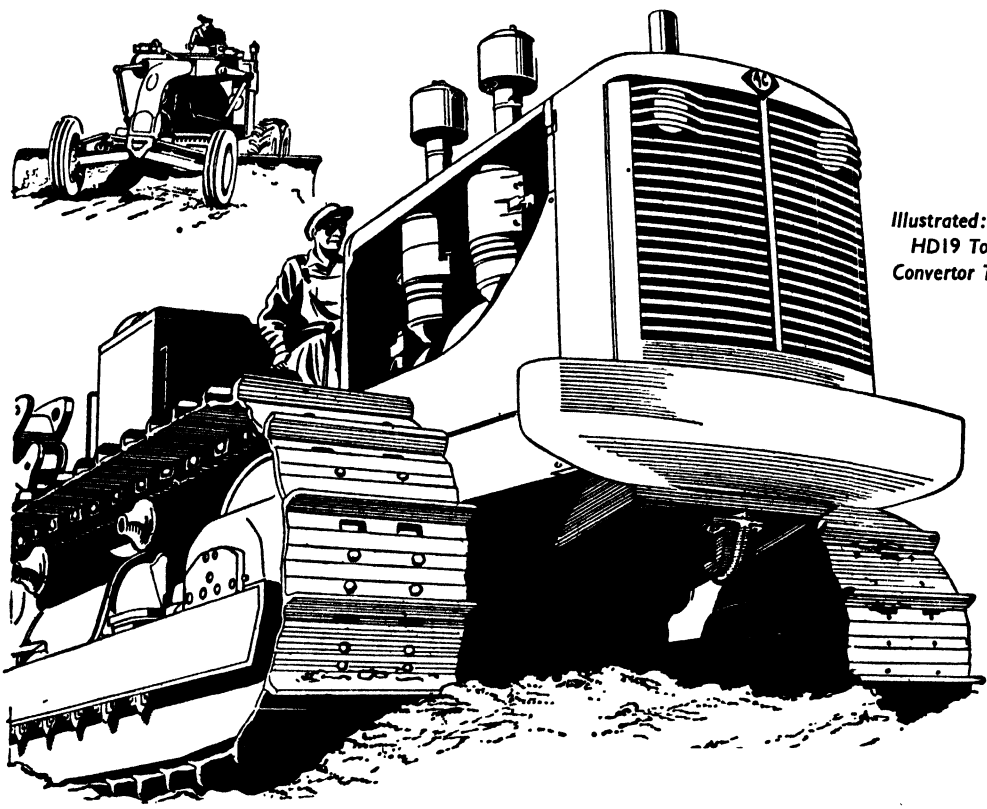

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The Outlook for 1949.

THE beginning of a new year is perhaps an appropriate time to pause for a moment to look at the future. For most rural industries, as for most other businesses, 1948 was a year of high incomes—a year of general prosperity. Although costs were high, perhaps higher than they have ever been, returns were also high. The price of Australia's two major primary commodities, wool and wheat, reached record levels, and these prices combined with an exceptionally good season, gave wheatgrowers and wool producers record gross incomes and, despite high costs, record net incomes.

Nevertheless, 1948 was a year fraught with difficulties for the primary industries. The labour position, although much better than in the mid- and later war-years, and even 1947, remained difficult. Experienced rural workers were hard to obtain and wages were high. The country's established transport system proved incapable of meeting the heavy demands placed on it, due at least in part to a serious shortage of coal. At the same time most types of agricultural machinery, including tractors, were still in short supply, although here, as with labour, there were notable signs of an improvement in the position; building materials were still extremely difficult to obtain and this, combined with the difficulty experienced in obtaining suitable labour, meant the postponement of or delay in effecting new improvements and in maintaining existing fences and other improvements.

In looking back, however, it is well that the farmer should remember that he was not alone in experiencing these difficulties; similar problems were encountered in almost every type of industry, by almost every type of business. All things considered, it is doubtful whether any single industry had a more prosperous or more generally satisfactory year than the wheat, wool and dairying industries. Whether those industries have ever experienced such a generally satisfactory year as 1948 is very doubtful—if they have it was a long time ago.

What of 1949?

So much for what is past; what of the future?

In times such as we have experienced during the past few years, when both prices and costs rise steeply, it is usual for prices to rise more quickly than costs, so that in effect *net* incomes increase while the price rise continues. It is, however, also usual for costs to continue to increase for some time after prices have ceased to rise—and even after they have begun to fall.

For most primary products it would appear that the price peak has been reached; in some few cases it was reached some little while ago. But costs are still rising and appear likely to continue to do so. The tendency in 1949, then, would appear to be

a fall in gross receipts accompanied by further cost increases, resulting in a distinct shrinkage in net farm incomes.

Net Incomes Should Still be High.

However, given an average to good season, most primary producers should still earn excellent net incomes—probably higher than in any year other than 1948 in the past two decades. The only producers who appear likely to experience low earnings are poultry farmers and some fruitgrowers.

In contrast to other industries, woolgrowers and meat producers may easily experience higher gross and higher net incomes than in 1948, and whether or not they are higher than last year they should certainly be excellent.

It is probable that there will be some comparatively small increase in the price received by growers for that portion of their output sold on the Australian market in those cases—such as for wheat, butter and eggs—where the home consumption price is fixed independently of the overseas price. For instance, it is probable that the cost of producing wheat will show a slight increase during the year, and consequently the home consumption and guaranteed price fixed under the Wheat Stabilisation Plan may be expected to be increased slightly towards the end of this year. Similarly it is possible that there may be small rises in the price received for home-consumed butter, meat, milk and eggs, but, with the possible exception of meat, these increases are unlikely to do more than compensate for increased production costs.

On the other hand it does appear that the overseas price for Australia's main primary exports, other than meat, has either reached or has passed its peak. It is appropriate to deal first with Australia's two major exports, wool and wheat. Not only are these two commodities Australia's most important primary exports, but they are also the only primary exports of real importance for which a guaranteed market is not assured by contract—for 1949 at least, and in some cases for several years ahead.

Wool—High Prices Likely to Continue.

The early part of the 1948-49 selling season has been characterised by record prices—prices surpassing those of last season, which themselves created records. It is quite impossible to forecast accurately the wool market, but it is the generally considered opinion that although prices may recede from the record levels of December, 1948, they will remain very high during the remainder of the present season, and there is every reason to believe that they will continue to be high next season.

The figures quoted below give an indication of the movement in the wool market before, during and since the war. It will be noted that the average price during the first four months of the current season was more than four times greater than the average price in 1938-39, and more than three times greater than that received during the early and middle war years.

Greasy Wool.
Average Price per lb.

	d.
1934-35	9.75
1936-37	16.48
1938-39	10.39
1939-40	13.44
1941-42	13.44
1943-44	15.45
1946-47	25.10
1947-48	39.97
*1948-49	43.59

The increased prices realised during the present selling season are generally accounted for by the fact that many European countries appear to be accumulating reserve stocks, and more recently, by spirited Russian buying. However, J.O. stocks are being liquidated rapidly and it would appear that demand for Australian wool will continue to be heavy for some time to come.

Wheat Prices Past Their Peak.

The Wheat Stabilisation Scheme, upon which final agreement was reached last year, assures the grower of a payable price up to and including the 1952-53 crop. However, the over-all return appears hardly likely to be as high during that period, or even in 1949, as it was in 1948. Overseas wheat prices reached record levels during the first half of 1948 and have since declined considerably. Only below-average yields in Europe and North America this year could cause overseas prices to increase again. Given average to above-average yields in those countries, prices may be

* First four months of season.

expected to fall further during the present year, and if bumper crops are again harvested in Northern Hemisphere countries the fall may be substantial.

Irrespective of the extent to which the overseas price falls, the Australian wheatgrower is protected. The Australian economy would, however, suffer quite materially if wheat prices were to fall very substantially.

Export Prices Ensured by Contracts.

Neither the livestock, dairying nor poultry industries rank with the wool and wheat industries in importance insofar as export income is concerned. Nevertheless, substantial quantities of the produce of these industries are regularly exported. The livestock and dairying industries are fortunate in that forward contracts ensure satisfactory export prices during the present year and, in the case of dairy products, for seven years in all.

Both meat and dairy products fall into a rather different category from Australia's other primary exports. Meat and fats and oils of all descriptions have been in short supply throughout the war and since. These products, other than perhaps pigmeats, are likely to remain in short supply for much longer than wheat, rice and other grains, the production of which can be increased relatively quickly.

European and Asiatic production of bread grains may reach the pre-war level within the next year or two, and although rice production is not returning to normal as quickly, the position is improving. On the other hand, livestock production cannot be increased rapidly, and it is unlikely that livestock numbers will reach pre-war levels in Europe for several years. Consequently, the export demand for Australian meat and dairy products is likely to remain heavy and prices are likely to remain high for a number of years.

As far as meat production in 1949 is concerned, it appears that, due to adverse seasonal conditions at present being experienced in Queensland and as an aftermath of the 1945 drought, there will be a shortage of beef, and beef prices are, therefore, likely to show some increase. Mutton and lamb prices depend so much on the wool market, and of course on seasonal conditions, that it is impossible to attempt any detailed forecast, but there can be little doubt that prices will remain high, and returns to producers should be most satisfactory.

The poultry industry is also assured of an export market for the next four and a half years. However, in this instance the United Kingdom's contract price is rather low, and it would appear that the local market will have to subsidise the poultry farmer to offset losses incurred on the export market. The present organisation of the egg industry is such that this can be achieved, provided the policy is not pushed too far. The poultry industry is one of the few primary industries which possibly will not enjoy great prosperity during the present year. However, overall, its position should not be worse than in 1948 despite some increase in costs.

The Labour, Materials and Machinery Position in 1949.

In general, the position may be summarised by saying that overall prices may be down a little and costs up, so that net farm incomes, while still being high, will be somewhat lower than the record levels of 1948. But what of the supply position of tractors, building materials and labour?

Superficially there may not appear to be much change as the year progresses. However, there is every reason to believe that the tractor and agricultural implement supply position will improve during the year, although the cost of this type of capital equipment will continue to be very high. The production of medium-sized American-designed tractors in Australia is well under way and deliveries should commence in 1949; this output added to substantial imports of small and medium-sized British tractors which are being and will continue to be made should substantially improve the tractor position. At the end of 1948 several thousand more tractors were being used in Australian agriculture than at any previous period, and it is certain that there will be a substantial increase in the mechanisation of Australian agriculture during the present year.

The supply of building and fencing materials available to primary producers may, unfortunately, not improve to any extent, due to the heavy building programme in progress throughout the country and

even if there is some improvement it seems certain that building materials in general will remain in extremely short supply throughout 1949.

The other problem of major concern to most farmers at the present time is obtaining labour. What will 1949 bring in this regard?

Again there may appear to be no change superficially. Labour will almost certainly continue to be difficult to get, and wages will almost certainly be high—possibly a little higher than last year. Nevertheless, indications are that there will be some slight overall improvement in the labour supply. Since the end of the war there has been a gradual movement of workers back to the farms, and it would appear that this movement will continue during 1949. It should be realised, however, that this movement is and will be of a purely temporary nature and will cease when all, or perhaps only part of the labour drawn off during the war has been replaced—unless, of course, there is a very substantial increase in Australia's output of rural commodities or a severe trade recession develops.—P. C. DRUCE, Economics Research Officer.

RURAL CREDIT.

Points Worth Watching.

MOST farmers find it necessary to borrow at some time in their career, from banks, storekeepers, machinery firms or other organisations and individuals. There are many different sources from which farmers can obtain credit and the purpose of this note is to deal briefly with the points which farmers should watch when borrowing.

The Price of Credit.

The price of credit is, of course, one of the most important considerations. At the present time interest rates are comparatively low and it seems likely that they will remain so. But the price of credit may contain other "hidden charges" which should be added to the interest rate.

Take, for instance, a farmer buying a piece of farm machinery. If he buys it on a hire-purchase system he will have to pay interest on the sum of money owing, just as he would if he borrowed money from another source to buy this piece of machinery. But a comparison of the two interest rates may not give a true indication of the relative costs of credit in the two cases. If he buys by hire purchase he may find that he has to pay a higher price than if he paid for it in cash. In this case the difference in price should be added to the cost of credit to obtain a truer comparison. Sometimes the actual listed price does not reveal the real difference, as sometimes a discount is allowed for cash payments—which should then be taken into account in calculating the real costs of obtaining credit by the two methods.

Where the price of the machinery in question is small, such differences may not be of much importance, but in the case of some of the more expensive items of farm machinery, such as, for instance, tractors or automatic hay balers, the difference in real costs of credit may be fairly substantial.

Another type of credit which is very popular in rural areas because it is very convenient is store credit. Here again hidden charges may be important. Some storekeepers make a practice of charging higher prices on goods bought on credit than on goods which are paid for in cash.

A large amount of credit is obtained through private lenders, usually operating through solicitors. In many cases purchasers of farm properties who have insufficient financial resources pay only a proportion of the price of the property in cash, and give the seller a mortgage for the remaining portion of the purchase price. This type of credit is open to serious abuses and there is little doubt that in very many cases the buyer is induced to pay a much higher price for the property by means of such mortgages. The difference between this price and the "cash" price should of course be added to the interest still payable in order to arrive at an estimate of the real cost of such credit. Also in many cases of this kind initial costs to the borrower are high and may include procuration fees.

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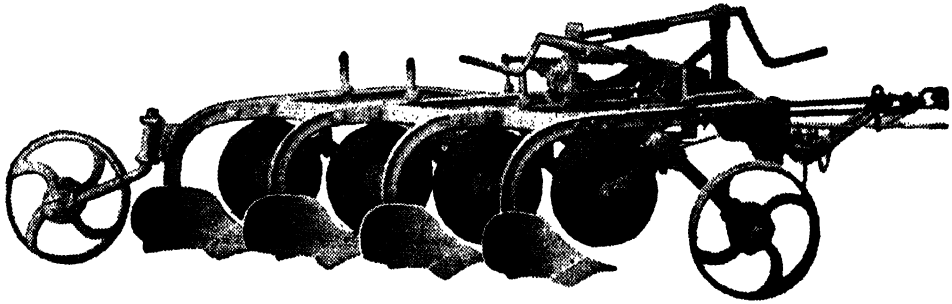

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The Period of the Loan.

The period of the loan is of importance to the farmer, from the point of view of security and convenience. The farmer must first of all decide the period in which he can reasonably repay the loan. If he borrows money in order to purchase a farm, to build new sheds or to improve his existing building substantially, the loan should be a long-term one of not less than twenty years' duration, because it is very unlikely that he will be able to repay the whole of the loan in a shorter period. If a loan for a shorter period is obtained it will probably be necessary to obtain further financial assistance in the future, and this will involve the farmer in extra cost and may prove seriously embarrassing if the end of the loan concides with a period of depression when it is hard to obtain credit.

If the loan is incurred in order to purchase livestock or expensive machinery it should be of about four to five years' duration because it is difficult in normal times for farmers to repay such loans in a shorter period. At the present time farm incomes are well above the average and it may be possible to repay such a loan in a shorter period, but it may be dangerous to rely on the maintenance of current high prices for long.

Whilst there is a danger in a loan which is too short, if the period for which a loan is contracted is longer than necessary, additional burdens are also imposed on the farmer who has to continue to make interest payments on money which is lying idle.

Elasticity of Credit and Risk of Embarrassment.

Closely related to the question of the period of the loan is the attitude of the lender towards renewal. It is sometimes difficult to decide the length of time for which borrowed money will be required in the farm business; prices may change unexpectedly, seasons may be exceptionally good or bad. It is therefore of importance to the farmer to consider the attitude and financial position of the lender.

Farmers frequently have to make quick decisions; a harvester may suddenly break down completely in the middle of the harvest or the farmer may suddenly be taken ill. In these cases of emergency, farmers who can contact their creditors immediately and obtain prompt extensions of loans due or additional funds will be in a much better position than farmers tied to an inelastic, unalterable schedule of repayment, and who are possibly unable to contact their creditor promptly.

The financial strength of the lender is also of importance to the farmer. If he borrows from an individual whose interests are confined to one district, or from an institution which only operates in a single area, the dangers of embarrassment are increased. If, for the sake of argument, one particular area is heavily hit by a series of drought years, lenders with interests concentrated in this area will be more seriously affected and hence less able to extend loans than lending institutions which operate all over the State or the Commonwealth and which are therefore far less affected by temporary climatic reverses in a single district.

Borrow for Productive Purposes Only.

It is common sense only to borrow for productive purposes, but there are many farmers who borrow without considering whether such credit will enable them to increase their income sufficiently to make the borrowing worthwhile. Farmers should, of course, try to improve their living conditions, but if an attempt is made to do this by means of borrowing, such an improvement will not be permanent; on the contrary, it is bought at the expense of the standard of living in the future.

It is not easy to determine whether a certain investment will pay for itself over the years; a lot depends on prices and seasonal conditions. In general, farmers tend to take an over-optimistic view in periods of prosperity and an unduly pessimistic view during depressions At the moment a warning may be timely that farm budgets and borrowing should not be based on too optimistic a view of future price levels. As a general rule—though there will, of course, be frequent exceptions where borrowing is worthwhile—the present period of high farm incomes should be used rather to reduce liabilities and borrowing.

Amortisation.

Lastly, it should be stressed that farmers gain from repaying loans gradually over a period of years rather than arranging for repayment of the loan at a fixed date. The saving in total interest and

repayment as a result of repaying during the whole length of life of a loan can be very considerable. For instance, if £1,000 is borrowed at 5 per cent. for thirty-five years; the total interest bill is £631 more when repayment is made in a lump sum at the end of the period than when gradual repayment of a fixed portion of the loan is made each year, so that the total liability is wiped out in thirty-five years.

When is the Best Time to Borrow?

This is, of course, a very difficult question to answer, but an illustration of what constitutes a good and a bad period for borrowing may be taken from past experience in the inter-war years. Take, for example, two farmers who borrowed substantial amounts in order to improve their properties—one in 1926-28 and in the other in 1936-38. Farmer A, who borrowed in 1926-28, will have had very much more difficulty in repaying his debt than Farmer B as farm prices fell in the early 'thirties, not only in absolute monetary terms, but also relative to his costs. Farmer B, who borrowed in 1936-38, found that the improved productive capacity of his property enabled him, thanks to the higher absolute and relative farm prices in the 'forties, to repay his loan much more easily.

What is the position to-day? Although, as mentioned earlier, it is very difficult to forecast future price movements, farm prices at the present time are at a very high level relative to farm costs. Whatever happens in the future to the absolute level of farm prices, it is very likely that the present favourable relation between farm prices and farm costs will deteriorate (probably as a result of greater increases in farmers' costs) in the not-too-distant future. This will mean a reduction in the level of farmer's incomes, and hence it will become more difficult to make repayments of debts. It seems therefore, under present circumstances, most advisable to reduce indebtedness as much as possible whilst farm incomes are still at their present high level.—F. H. GRUEN, Economics Research Officer.

Correction of Erosion in Orchard Land.

WHEN orchard soils have become eroded, their management is at fault. New planting on soils and slopes which are likely to erode should be on the contour, and cultivation always along the contour lines—never up and down the slope.

The degree of erosion on an established orchard determines the control measures to be followed. It may be sufficiently serious to justify erection of contour banks. Before doing this, however, the orchardist is strongly advised to seek skilled advice.

In less serious cases erosion may be checked by such practices as:

1. Using the plough wherever possible instead of the cultivator.
2. Directing all operations across the slope.
3. Taking full advantage of the soil-holding abilities of a weed cover or green manure crop.
4. Strip cultivation amongst young trees.

Clean cultivation, with the frequent use of cultivators, forms a fine surface tilth which washes away very readily. In addition to removing the top soil, which is richest in plant food, erosion exposes a surface which is lacking in ability to absorb and retain moisture.—DIVISION OF HORTICULTURE.

NUMEROUS specimens of the plant "Salsify" (*Tragopogon porrifolius*), a native of Europe, which has become naturalised in the eastern States of Australia, have been received recently by the New South Wales National Herbarium.

Salsify is a stout biennial of the daisy family with rather conspicuous purple portions on the flowering heads. It is found mainly on waste land, but is not considered troublesome owing to the edible nature of both tap-root and leaves, the latter being sometimes used for salads.—R. H. ANDERSON, Chief Botanist.

BEST results cannot be secured when branding cattle unless the iron is properly heated and the correct touch exercised by the person branding. A good fire is essential, but it is not wise to heat brands in a forge as they are likely to become too hot. Branding irons must be used when really hot, otherwise much time is wasted, the animal is caused unnecessary pain and a faulty brand results.

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BLACK SPOT OF CITRUS

In New South Wales Coastal Orchards.

T. B. KIELY, B.Sc.Agr., Plant Pathologist.

BLACK SPOT is one of the more serious diseases affecting citrus fruits in coastal orchards, where losses estimated at £70,000 in one year have been suffered. The condition is most serious on the late Valencia orange fruit, but lemons and grapefruit develop the disease to a less extent under Central Coast conditions. Mandarins and Washington Navel oranges are affected on the North Coast, where winter conditions are somewhat warmer at a time when these varieties are maturing their fruit.

The disease occurs in China, Japan, Formosa, India, the Philippine Islands, Java, Brazil, the Argentine, the U.S.S.R., South Africa and Australia. In this country it is restricted to the east coastal strip, and has not been observed or recorded on fruit from inland, low-rainfall citrus-growing areas.

As the fruit on the northern side of the tree is the first to be affected with Black Spot, the disease can be readily distinguished from the Septoria Spot disease on citrus fruits of the inland areas, which it superficially resembles, as this latter condition is more serious on the south side of the tree.

The disease is caused by a parasitic fungus the spores or "seeds" of which infect the rind of the fruit when it is quite young, the susceptible period extending from blossoming until about five months later. The spots do not appear until the fruits are maturing in the following spring. This delay between infection and disease development is the reason why the young fruits are sprayed during the period when they are susceptible to infection, in order to achieve control of the disease on the mature fruit.

Symptoms of the Disease.

Spots occur very rarely on green orange leaves, but are observed more frequently on lemon foliage (Fig. 5). When they do occur, the spots vary in size from 1/16 to 1/8 inch in diameter, being sunken and visible from both sides of the leaf. Usually the leaves affected are senile.

Losses from this disease result from the development of spots on citrus fruits, particularly on the Valencia orange, three types of spots being produced in the course of the development of the disease on unsprayed fruit. These types are referred to as Hard Spot, Freckle Spot and Spreading or Virulent Spot. They are sharply defined, and occur at different stages, depending on the advance of the season and the maturity of the rind of the fruit.

Early in the spring Hard Spot lesions are produced (Fig. 1). These spots vary from about 1/16 to 1/8 inch in size, being at first

Fig. 1.—Mature Valencia Orange Fruits on which Hard Spots have Developed.

Note the green "halo" around the restricted spots. The fruit was collected during September.

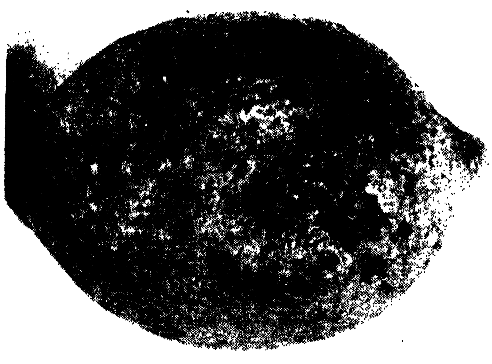

Fig. 2.—A Mature Eureka Lemon Fruit on which a Development of Freckle Spots has taken place.

Later this was followed by the development of a virulent spot.

circular and brown with a slight depression in the centre. Around the margin they are black in colour with a narrow, outer green ring. These spots do not increase greatly in size. The disease is not serious at this stage, as fruit-keeping quality is not affected.

Later in the spring as the rind becomes more mature, Freckle Spots develop (Fig. 2). As many as fifty to several hundred separate deep-orange to brick-red spots appear together on the surface of the rind exposed to the sun within two to four days. Spots of this type grow rapidly, usually reaching a size of ¼ inch before turning brown in colour and ceasing to make any further noticeable growth. This stage of the disease greatly reduces the keeping quality of the fruit.

When the rind is fully mature, with the onset of warmer conditions, Virulent Spot begins to appear both on unblemished fruit (Fig. 4) as well as on fruit with other types of spots developed earlier in the season (Fig. 3). This is the most serious form of the disease, as two-thirds of the fruit surface may be affected by the irregular growth of a single spot in four to five days. Affected fruit falls readily, and in orchards where protective spraying has not been adopted, half the crop has been known to drop within several days.

Conditions Influencing the Development of the Disease.

Conditions most favourable for the development of Black Spot from its latent or dormant condition, are hot days accompanied by dry winds in spring and early summer as the rind of the fruit is approaching maturity. The most rapid development of spots on the mature fruit occurs at 87 deg. Fahr. Where such weather conditions coincide with the peak maturity of the fruit, a Black Spot epidemic in its most severe form occurs. Later in the summer the rind of some crops of Valencias commences to re-green. After this has occurred, very little further Black Spot development takes place.

Many things can and do influence the time and extent of the peak maturity of Valencia fruit, and so affect the severity of the disease. Trees of full vigour, recently skeletonized trees, young as compared with old trees, trees with a southern aspect and trees on heavier soils or where supplementary irrigation is practised in the spring, all mature their maincrop fruit later in the season and so tend to escape Black Spot development. In fact, with fruit on young trees, re-greening of the rind often occurs in early summer before the date of peak maturity of the fruit. Despite the presence of adequate dormant infections in the rind of this fruit, no Black Spot development occurs.

Latent Infection of Citrus Leaves.

Although spots on the leaves of orange, lemon and grapefruit trees growing under central coastal conditions are normally uncommon, it has been demonstrated that each

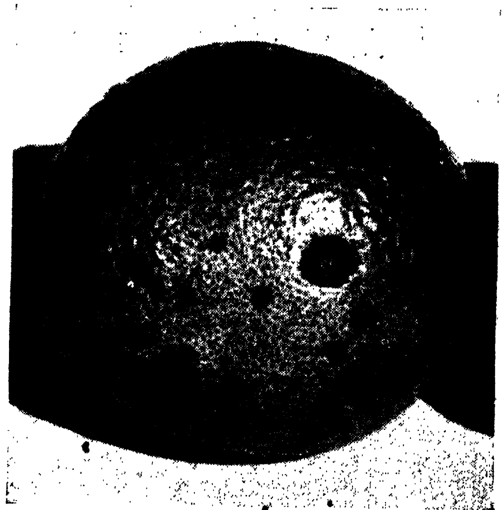

Fig. 3.—Valencia Orange Fruit on which Hard Spots have Developed, to be followed later by the Development of Two Larger Virulent Spots.

of these leaves harbours a great number of latent or dormant infections of the Black Spot fungus, which are invisible to the unaided eye. These infections do not impair or harm the function of the green leaves on the tree, but later, when the leaves are shed, and decay, the latent infections serve as a most important source of infection of the disease on both new foliage growth and immature fruit.

It has been shown that these invisible infections occur not only in the leaves on trees on which fruit, at maturity, develops Black Spot year after year, but also within the leaves on young trees the fruit of which normally remains free from Black Spot. Even yearling citrus trees raised in coastal nurseries harbour the dormant infections in their apparently healthy green leaves.

Sources of Infection.

It was thought formerly that spores of the Black Spot fungus washed down through the trees from spots developing on mature Valencia fruit, constituted the main source of infection of the disease. Removal of the entire main crop fruit in an isolated orchard just before the setting of the new season's fruit, however, did not give any reduction of the disease the following year. This indicated that other more important sources of infection were available to attack the young fruit.

It was discovered that when citrus leaves drop from trees at any time of the year under central coast conditions, an enormous quantity of spores of another stage of Black Spot fungus develops on the dead leaves. Development commences from the dormant infections that were present within the green leaves. This particular type of spore takes about three months to mature. During that period special conditions are necessary if the spores of the Black Spot fungus are to ripen. The leaf litter must be frequently moistened thoroughly either by rain or by heavy dews.

In those inland districts where these conditions do not normally occur during the several months prior to the setting of the new-season's crop, the causal fungus cannot survive, and the disease does not occur.

In contrast to the spores of the Black Spot fungus formed in the diseased spots on the fruit, the spores formed on the dead leaves are carried about in the air currents and so are able to spread the infection over a wide area.

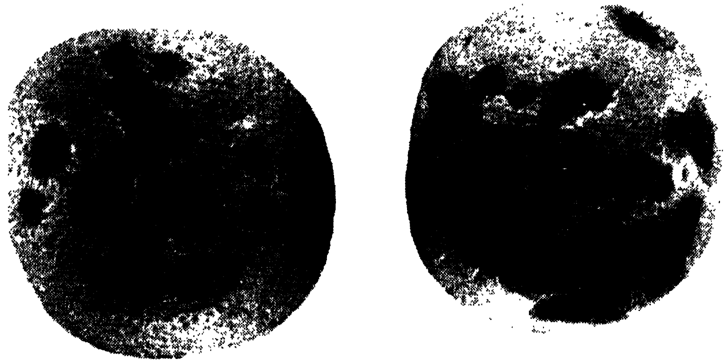

Fig. 4.—Valencia Orange Fruits showing Early (*left*) and Later Stage (*right*) Developments of Virulent Spot.

In addition to leaves of citrus, leaves of quite a number of bush shrubs have been shown to harbour the latent infections in an invisible form. Later as their leaves die, these plants also provide air-borne infection to citrus orchards. The native host plants are the Waratah, the wild Sarsaparilla, the Turpentine tree, the Christmas Bush and the Red-flowering Bottlebrush. Latent infections have been demonstrated also in the leaves of camellias, magnolias and the bush orchid.

The alternate host plants are not regarded nearly as important sources of infection as the dead citrus leaves; moreover, their presence makes the eradication of the disease virtually impossible.

Life Cycle of the Black Spot Disease.

It will be observed from a study of the life cycle of the fungal parasite (Fig. 6) that its wind-borne spores (ascospores) infect not only the new season's fruit, but also

Fig. 5.—Green Leaves of Eureka Lemon showing the Development of Black Spots, viewed from the Dorsal Surface.

Leaves of Valencia and Washington Navel Orange rarely show spots.

establish latent infections in the current season's spring and autumn foliage growth. Adoption of control measures to protect the young fruit in October has little or no effect on leaf infections which occur during September and March. Consequently an abundance of spores is always available in the orchard whether preventive measures are adopted or not.

This has been the experience of citrus orchardists, some of whom have sprayed for this disease yearly for the past twelve years with highly satisfactory results, yet even now an omission to apply the recommended programme results in serious Black Spot development on the mature fruit the following summer.

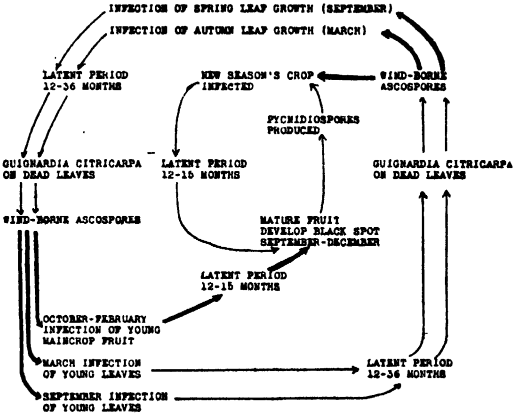

Fig. 6.—The Complete Cycle of Infection showing the Parts Played by the Wind-borne Ascospores and the Water-borne Pycnidiospores.

Export of Fruit to Indonesia.

THE Indonesian Government has agreed to accept the pre-war conditions for admission of fruit from Queensland, New South Wales and Western Australia, according to W. M. Carne, Supervisor, Fresh Fruit Exports, Department of Commerce and Agriculture.

These conditions require a precooling of export fruit during at least seventeen days, at a temperature of 37 degrees Fahr. or lower, or that the fruit be so stored before discharge from a refrigerated steamer. Fruit carried by ships without refrigeration, either in holds or on deck, or by air, must be precooled for the full period specified.

Deck cargoes not precooled, in transit to other countries via Indonesian ports, are subject to inspection. If infected fruit is found, such deck cargoes may be prohibited in future.

The minimum periods of precooling accepted for fruit carried by refrigerated ships before the war were: for New South Wales, 8 days; Queensland, 10 days; and for Western Australia, 12 days.

CONSIDERABLE blossom damage has occurred in the Batlow district this season owing to thrips infestation of pome fruits. It is believed that fruit-setting will be affected, and this following on a generally light blossoming indicates the prospect of a light apple crop this season.

The thrips population built up very quickly at early blossoming but then appeared to be checked to a certain extent by cold weather conditions. Growers in the later portions of the district are expected to suffer the greatest losses, although many have applied DDT emulsions (.1 per cent.) with excellent results.—DIVISION OF HORTICULTURE.

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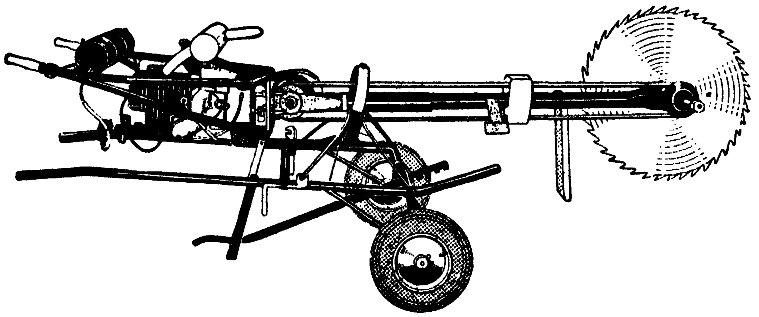

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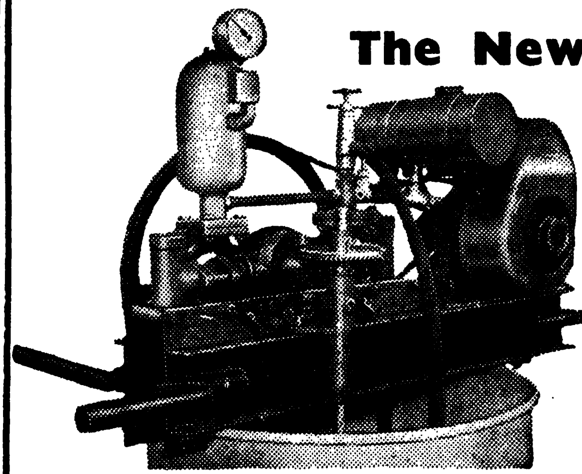

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WHIPTAIL OF CAULIFLOWER

Control by the Use of Ammonium Molybdate and Sodium Molybdate.

(*Concluded from Vol.* 59, *page* 630.)

E. J. WARING, B.Sc.Agr., Agronomist, R. D. WILSON, M.Sc., M.Sc.Agr., Plant Pathologist, and N. S. SHIRLOW, B.Sc.Agr., Agronomist.

THIS article deals with experiments and observations which have been carried out during the 1947 and 1948 seasons in the central coast area of New South Wales, using ammonium molybdate and sodium molybdate for the prevention and cure of whiptail.

The first portion, which appeared in the December issue, dealt with the economic importance of the disease, its symptoms, factors influencing its occurrence, and with trials conducted in co-operation with growers.

This concluding section describes the effects of field and seed-bed applications of molybdenum compounds by growers and at Hawkesbury Agricultural College, and includes a discussion and summary of the experiments and observations.

Field Applications by Growers.

Following advice given by one or other of the writers to growers whose crops were showing symptoms of interveinal chlorosis indicative of the early stages of whiptail, six growers treated all or part of their crops with ammonium molybdate during the past season. In the case of two of the crops, one of the writers (E.J.W.) personally assisted in the application of the ammonium molybdate and in these two cases some untreated plants were left as a check. The growers who applied the material to their crops are shown in Table 2.

TABLE 2.—Growers Who Applied Ammonium Molybdate to Crops After Transplanting.

Grower.	Area Treated.	Rate of Ammonium Molybdate per Acre.	Method of Application
	Acres.	lb.	
M. J. Smith, Corn wallis, Windsor.	4	1½	Mixed with superphosphate and applied as a side-dressing. Two bags* of superphospate per acre.
C. de Kantzow, Pitt Town, Windsor.	5	2	Dissolved in water and applied with a sheep drenching gun.
W. Wilmott, Tennyson.	1	½	do do
S. Carmagnola, Canley Vale.	1	1	Dissolved in water and applied with a small bottle.
J. Porrok, Fairfield West.	1	1	do do
P. Chulman, St. John's Park	½	1	Dissolved in water and applied by means of a watering can.

* 1 bag = 187 lb.

In Mr. Smith's crop most of the plants were showing slight symptoms of interveinal chlorosis on some of the fully-developed leaves, but none of the central leaves showed any edge burn at the time of application of the superphosphate-ammonium molybdate. A small section of this crop was left untreated, and almost every plant in this untreated section developed symptoms of whiptail, whereas no treated plant became affected.

In Mr. de Kantzow's crop, nearly all the plants were stunted and the interveinal areas of the larger leaves were yellowish-green in colour. A few plants had developed whiptail and the smaller inside leaves of some of the plants showed a burning of the edges before the solution of ammonium molybdate was applied. Within a week the treated plants had shown a remarkable improvement in colour, the leaves becoming a healthy green and there being an absence of edge burn on all newly-formed centre leaves. In a small untreated section of this crop, in the same period of a week, the leaf colour did not change to a healthy green and the developing centre leaves continued to show edge burn. Later, some of the untreated plants showed some natural recovery and improvement in colour, but at harvest over 60 per cent. of these untreated plants were recorded as severely affected with whiptail, whilst none of the treated plants had shown any further sign of the disease after applying the solution of ammonium molybdate.

Mr. Wilmott's crop was so severely affected with whiptail when inspected about

and a half months after planting, that he intended ploughing it in, and he undertook to treat it, more with the idea of saving the remaining 30 or 40 per cent. of lightly-affected plants, than of curing the whole planting. Almost every plant in the paddock had at least one disfigured leaf. After treatment, all except a few plants completely recovered, made healthy new growth and were successfully marketed.

In the case of the crops treated by Messrs. Carmagnola and Porrok, at Canley Vale and Fairfield West respectively, about a quarter of the plants in both crops were showing a yellowing of the interveinal areas of the leaves, edge burn of the inner leaves and, in some of the more advanced cases, some of the leaves had developed into the typical "whiptail" form. Within two weeks after treatment in both crops, the yellow colour had disappeared from all except a few of the older outer leaves and all new centre growth was healthy and free from any sign of edge burn.

Mr. Chulman's crop of about 1,400 plants had only one healthy plant in it when treated. All other plants were showing severe interveinal chlorosis and the centre leaves were showing edge burn. After treatment all new centre growth was healthy and within about three weeks all leaves except an occasional outside leaf were a dark-green colour.

Treatment of Severely-affected Plants.

With the object of determining whether the application of molybdenum would cure severely whiptailed plants, eight such plants on the property of Mr. S. Carmagnola, Canley Vale, were treated with one fluid ounce of solution containing 0.2 grams (about 1/140 ounce) of ammonium molybdate (A.R. grade). The solution was applied to the soil at the base of the plants on 30th April, 1948. An additional five similarly affected plants were marked and left untreated. The thirteen plants selected for this experiment were all showing yellowing of the interveinal areas of the old leaves, severe whiptail of the leaves in the "middle position" and a very severe edge burn of the "centre leaves." The green leaf tissue on all of the central leaves had almost completely disappeared, leaving a centre composed of little more than midribs.

When inspected on 17th May, seventeen days later, all the eight treated plants were showing evidence of recovery by the production of healthy new growth in the centre. Further inspections made on 21st June and 6th July showed that the recovery in treated plants continued and at the last inspection on 6th July all the treated plants showed no trace of whiptail except on some of the outer leaves. The treated plants though quite healthy (with the exception of these outer leaves) were showing evidence of the setback they experienced earlier by the fact that they were not as large as nearby untreated plants which had never been affected with whiptail.

The five untreated plants were now all much smaller than the eight treated plants. They were still severely whiptailed and the centre leaves were still showing severe edge burn.

Seed-bed Applications by Growers.

Following a suggestion by one of the writers (R.D.W.) in 1947 to Mr. J. G. McDonald, of Ace Farm Supplies Pty. Ltd., the latter supplied a Windsor grower, Mr. J. Stubbs, with a small quantity of ammonium molybdate for a seed-bed application. Mr. Stubbs in 1947 treated a small area of his seed-bed with the material dissolved in water and watered on to the plants, at the rate of about ¼ oz. per square yard. A row of plants from the treated portion of the seed-bed and a row of untreated plants were both given a heavy dressing of sulphate of ammonia, which, in Mr. Stubbs' experience on his land, will almost always induce whiptail. Mr. Stubbs reported to the writers that none of the plants which had received ammonium molybdate in the seed-bed developed whiptail, whereas every plant from the main untreated section of the seed-bed which, after transplanting, had also received the heavy sulphate of ammonia application, developed whiptail so severely that no marketable curds were produced.

In 1948, Mr. Stubbs and several other growers in the Windsor district and also Mr. A. Grimaldi, of Wetherill Park, made applications of solutions of ammonium molybdate to cauliflower plants in the seed-bed, the rates ranging from ¼ ounce to 1/10 ounce of the chemical per square yard of seed-bed. Mr. Stubbs in the past season treated all except a few hundred of his seedlings with ammonium molybdate. All the treated seedlings grew well but the untreated seedlings were conspicuous in the

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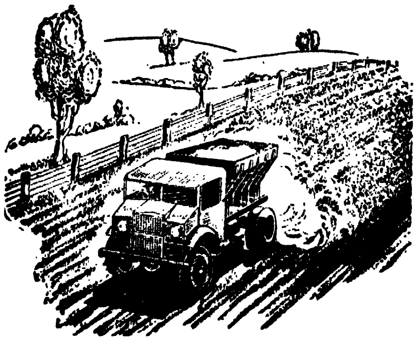

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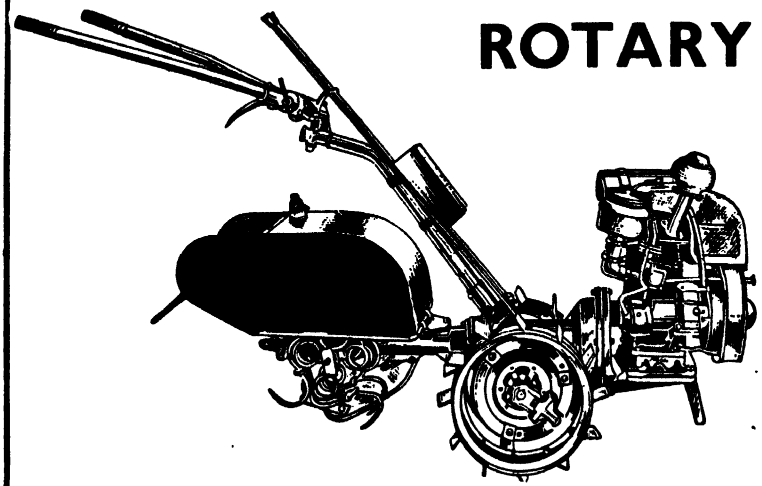

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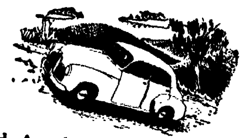

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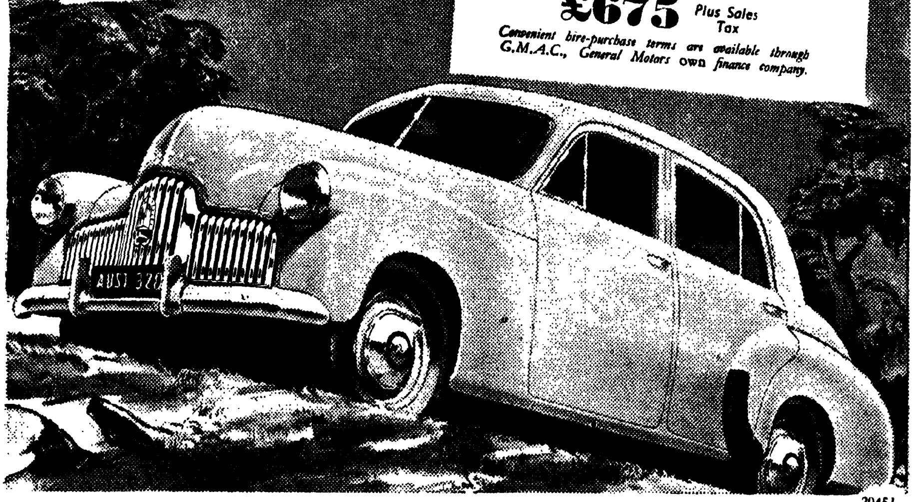

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paddock not long after transplanting by their yellowish-green colour. Most of these untreated plants developed mild symptoms of whiptail.

In crops grown by Messrs. A. Brown and A. Grimaldi, of Pitt Town and Wetherill Park respectively, and treated whilst in the seed-bed with a solution of ammonium molybdate (rates 1/5 oz. per square yard of seed-bed in each case) a trace only of whiptail developed, though both crops were planted in land which in previous years had been notorious for the production of whiptail affected cauliflowers.

Seed-bed Treatment Experiment at Hawkesbury Agricultural College.

During 1948, an experiment was carried out under controlled conditions at Hawkesbury Agricultural College to test the value of seed-bed applications of sodium molybdate in preventing whiptail. Five rates of the chemical were used, viz., 1-40, 1-20, 1-10, 1-5 and 2-5 oz. per square yard of seedbed. Seedlings from the treated seed-beds and from untreated seed-beds were planted out, half into soil to which sulphur at the rate of 500 lb. per acre had been applied and half on to soil which had not been treated with sulphur. Where there were sufficient seedlings, fifty plants from each treatment were planted out together with three lots of fifty untreated plants. Results of this experiment are shown in tables 3 and 4.

TABLE 3.—Seed-bed Treatment Experiment at Hawkesbury Agricultural College.

Soil Treatment.	Rate of Application of Sodium Molybdate in Ounces per Square Yard of Seed-bed.*							
	0	$\frac{1}{40}$	$\frac{1}{20}$	0	$\frac{1}{10}$	$\frac{1}{5}$	0	$\frac{2}{5}$
No Sulphur ...	$\frac{3}{25}$†	$\frac{0}{25}$	$\frac{0}{17}$	$\frac{5}{25}$	$\frac{0}{25}$	$\frac{0}{20}$	$\frac{0}{25}$	0/2[illegible]
Sulphur	$\frac{4}{25}$	$\frac{0}{25}$	$\frac{0}{17}$	$\frac{8}{25}$	$\frac{0}{25}$	$\frac{0}{25}$	$\frac{5}{25}$	$\frac{0}{17}$

* Treatments given in order in which the plants were placed in the field.

† Numerator—number of whiptail affected plants.
Denominator—total number of plants in plot.

TABLE 4.—Summary of the Results in Table 3—Seed-bed Treatment Experiment.

Soil Treatment.	Molybdenum.	No Molybdenum.	Totals.
No Sulphur ...	$\frac{0}{112}$	$\frac{8}{75}$	$\frac{8}{187}$
Sulphur	$\frac{0}{100}$	$\frac{17}{75}$	$\frac{17}{184}$
Totals......	$\frac{0}{221}$	$\frac{25}{150}$	$\frac{25}{371}$

Effect of Applications of Molybdenum Materials on Plants in the Seed-bed.

It has been observed that the relatively heavy rates of application of sodium molybdate or ammonium molybdate which have been made to seedlings in the seed-bed frequently result in the production of a blue colour in the stems and leaves. This blue colour is particularly evident in the stems, where it persists for some time after the plants have been put out in the field. A few tests have shown that large doses of 1 oz. or more per square yard of sodium molybdate or ammonium molybdate can be supplied to seedlings without lasting ill effect. If applications are made when the plants are very small there is a danger of producing a stunting which persists until the plants are put out in the field and, for this reason, the application should be deferred until the seedlings are well grown. Molybdenum is taken up rapidly by cauliflower seedlings and about a week before transplanting appears to be an ideal time for application.

Sources of Molybdenum for Commercial Use.

Of the molybdenum materials at present available on the local market and which are suitable for use for the control of whiptail, the cheapest and most satisfactory appear to be:—

(1) A crude sodium molybdate containing about 43 per cent. of pure sodium molybdate, and retailing at about 5s. 6d. per lb., and

(2) Pure ammonium molybdate, for which the retail price in Sydney is about 21s. 6d. per lb.

The molybdenum content of the crude sodium molybdate is about one-third of that of the pure ammonium molybdate. The crude sodium molybdate dissolves very easily in cold water except for a certain amount of insoluble residue, which consists mainly of sand. The ammonium molybdate is somewhat more difficult to dissolve in cold water. One disadvantage of the crude sodium molybdate is that, if left exposed to the air, it take up moisture and tends to set in a hard mass somewhat in the same manner as cement.

There may be other suitable sources of molybdenum available on the local market of which the writers have not heard; if so, they would be interested to have information from the manufacturers or distributors.

It is possible that one or more of the makers of mixed fertilisers will produce a fertiliser mixture for cauliflowers containing a suitable quantity of molybdenum material but, at the time of writing the authors have no information of any such molybdenised fertiliser.

Discussion.

The observations and experiments recorded in this article, added to the evidence submitted by Davies [3] and Mitchell [9] in New Zealand and by Hewitt and Jones[4] who, working at the Long Ashton Research Station in England, produced the main symptoms of whiptail in cauliflowers grown in sand culture when all known essential elements were supplied except molybdenum, leave little doubt that the main cause of the disease is an inadequate supply of molybdenum. In acid soils, this element tends to be less available to the plants than in neutral or alkaline soils, and this explains why, in most cases, the addition of lime or dolomite to the soil will prevent whiptail. Other factors such as the variety, the type and quantity of nitrogen fertiliser and soil aeration appear to influence the incidence and severity of the disease.

The outstanding reaction of whiptail-affected plants which have been treated with solutions of sodium molybdate or ammonium molybdate is that all new central growth produced after treatment is healthy and free from edge burn. This means that no whiptail leaves are produced after treatment, except those developing from central leaves showing edge burn at the time of treatment. Other reactions which follow treatment are the disappearance of oxidising materials from the interveinal areas of mottled leaves, as reported by Wilson and Waring[15], and the development of a healthy green colour on such leaves.

As far as control of the disease in commercial crops is concerned, the easiest and cheapest method of control is undoubtedly the application of solutions of soluble molybdenum compounds to the plants in the seed-bed. Molybdenum is required by plants in such small amounts that such a method should provide the cauliflower plant with sufficient molybdenum for its whole life. Whilst this method has, in the few cases in which it has been tested, given very satisfactory results, the appearance of a few whiptail-affected plants in two crops grown from plants which had received the seed-bed treatment suggests that the treatment may not always be completely effective. Possibly the best procedure for growers on whiptail-liable soils is to apply sodium molybdate or ammonium molybdate to plants in the seed-bed and, should any symptoms of the interveinal chlorosis appear in the plants in the field, to make a further application to such affected plants.

In the seed-bed treatment experiment at Hawkesbury Agricultural College, 1-40 ounce of sodium molybdate per square yard of seed-bed appeared to be as effective as any of the higher rates, but this small-scale experiment needs repeating before any reliable conclusions can be drawn as to the best seed-bed application rate.

In various experiments reported earlier in this paper, ½ lb. per acre of sodium molybdate applied directly to plants in the field proved effective in curing affected plants or in preventing the development of whiptail. In one small experiment (not reported above) applications of ammonium molybdate at the rate of 0.025 grams per plant(about ¼ lb. per acre) and also sodium molybdate at the same rate, resulted in the disappearance of oxidising materials from the interveinal areas of chlorotic leaves within three days, and the development of a healthy green leaf colour within a week. This suggests that this rate (¼ lb. per acre) applied in solution directly to the base of the plant is adequate for the cure of affected plants. Further experiments may show that even lesser quantities applied in this manner are effective.

No harmful effects on the plants have been noted following the application of sodium molybdate or ammonium molybdate at rates up to 4 lb. per acre and, on the results of the experiments so far carried out, it is suggested that, until further evidence is secured, 1 lb. per acre of ammonium molybdate or the equivalent amount of sodium molybdate would be a suitable rate of application to plants in the field. In most cases, rates in excess of this are unlikely to produce better growth of the cauliflowers and excessively high rates may even be harmful to the plants.

Recommendations for the Control of Whiptail.

In localities where whiptail does not occur and on most soils which have been treated with lime or dolomite at rates of a ton or more per acre within the preceding two years, the use of molybdenum materials will probably be of no value to the crop. In those areas where whiptail occurs and where the application of lime or dolomite does not give effective control of the disease or where it is not desired to use lime or dolomite, molybdenum materials are recommended. The use of sodium molybdate or ammonium molybdate is a cheaper method of controlling the disease than the application of lime or dolomite to the soil and, moreover, there are cauliflower-growing localities where potatoes are also an important crop. The addition of alkaline materials such as lime or dolomite to the soil is liable to increase the amount of common scab in potato crops subsequently grown in the land.

As indicated earlier, it is thought that the most suitable material to use is either a crude form of sodium molybdate manufactured by a Newcastle firm and containing about 43 per cent. pure sodium molybdate, or pure ammonium molybdate.

The easiest method of applying the material is to make an application to the seed-bed. One ounce of pure ammonium molybdate or 3 ozs. of the crude (43 per cent.) sodium molybdate are recommended for each ten square yards of seed-bed. The materials are dissolved in water and diluted so that each square yard of seed-bed receives a gallon of the solution. The solution should be applied one to two weeks before transplanting.

The crude sodium molybdate dissolves readily in cold water, but the ammonium molybdate, which is usually sold in the form of large lumps, is best dissolved in hot water. This latter material will, however, dissolve quickly in cold water if the lumps are reduced to a powder by grinding.

Should no seed-bed application have been made, or should symptoms of the interveinal chlorosis appear in spite of a seed-bed treatment, the plants should be treated in the field by applying 1 lb. ammonium molybdate or 3 lb. crude sodium molybdate per acre. The best method of applying the material to plants in the field so as to secure a quick recovery of affected plants is to water a solution around the base of each plant or pour the solution into the centre of the plant so that it runs down to the ground at the base of the plant. A satisfactory method of preparing the solution is to dissolve 1 lb. pure ammonium molybdate or 3 lb. crude (43 per cent.) sodium molybdate in 40 gallons of water in a 44-gallon drum. This solution can then be applied by means of a knapsack spray or with a watering can at the rate of 1½ fluid ounces per plant.

In some cases, in order to secure a more even distribution of the material, it may be desirable to increase the amount of solution per plant, with a corresponding reduction in strength. Where a sheep-drenching gun connected with a tank carried on the back is used, 1 lb. of ammonium molybdate or 3 lb. of the crude (43 per cent.) sodium molybdate is dissolved in 10 gallons of water and 10 c.cs (one-third fluid ounce approx.) applied to each plant. Where a strong solution like this is applied it is advisable to water within twenty-four hours in order to wash the material off the leaves and down to the plant roots.

A solution of ammonium molybdate or sodium molybdate can also be applied by introducing it slowly into the intake side of the irrigation system, but a larger application rate would then be advisable as a proportion of the material will not be reached by the plant roots.

Where water supplies are inadequate or where a side dressing of fertiliser is being made, it may be more convenient to mix the material with fertiliser and apply it in this manner. Until rain falls after such an application, or, until the crop is watered, the molybdenum will not be available to the plant, and it is because of the more rapid results following a "liquid" application that the former is preferred to a "dry" application. The "dry" method (i.e., mixed with fertiliser), however, probably involves less additional labour, especially where a fertiliser side dressing is being made in any case.

Summary.

The whiptail disease of cauliflowers as it occurs in the central coast area of New South Wales is described and experiments carried out in 1947 and 1948 involving the

field application of sodium molybdate and ammonium molybdate are reported.

These experiments have provided evidence that whiptail can be prevented or cured by the application of either sodium molybdate or ammonium molybdate.

The easiest method of control appears to be to water the seedlings in the seed-bed with a solution of a soluble molybdenum compound one to two weeks before transplanting. For the present, until further investigations are made, a rate of 1/10 oz. ammonium molybdate or 3/10 oz. crude (43 per cent.) sodium molybdate is recommended for each square yard of seed-bed.

For field applications after transplanting it is recommended that 1 lb. ammonium molybdate or 3 lb. crude (43 per cent.) sodium molybdate be applied to each acre. The most effective method of securing a quick intake of the material is to dissolve it in water and apply to the base of each plant. In many cases, however, it may be found easier to mix the material with ordinary fertiliser and apply it as a side dressing.

Acknowledgments.

The authors desire to express their thanks to the growers mentioned for their co-operation; and to the Thermolin Chemical Company, New Lambton, for the provision of the crude sodium molybdate used in some of the experiments.

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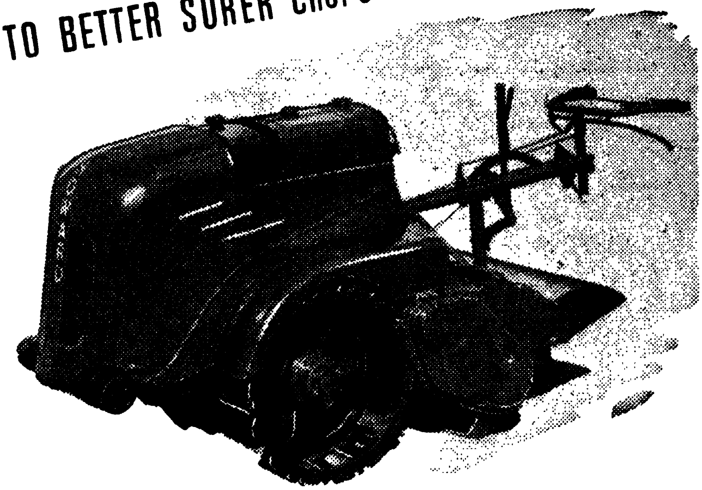

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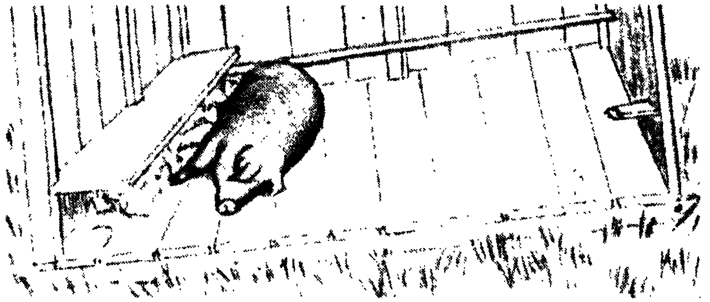

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Every pig-raiser has experienced the disappointment of seeing a large litter whittled down by a clumsy sow overlying or standing on her suckers during the first critical week after birth. The loss of pigs from this cause in the past has probably averaged 20 per cent., and, in some individual litters, has risen to 100 per cent. Such a loss is bad enough for commercial breeders, but is still more serious for stud breeders working with valuable lines of blood.

Accidental Discovery Saves Newly-born Pigs.

The accidental collapse of one end of the floor of a farrowing shed on a farm in Kentucky, U.S.A., has led to an improvement in shed design capable of greatly reducing the death-rate amongst newly-born pigs. The floor was not repaired for some time, and it was noted that sows farrowing on the slanting floor invariably succeeded in rearing all the pigs they farrowed. When the idea was tested out under experimental conditions at Kentucky University, it was realised that a discovery of great importance had been made.

The idea of a sloping farrowing shed floor is so simple and obvious that one wonders why it was not thought of before, and when a "hover board" is also provided, the complete safety of the young pigs is practically assured.

A sow lying on a slope usually lies with her head or back up the slope. As her pigs are born they roll or stagger down the slope to the safety provided by the braced hover-board—see title block. For the first two or three days after birth the suckers spend most of their time under the board. In fact, the sow mostly suckles them there, as she prefers to lie at the bottom of the slope with her feet resting against the back wall of the pen, under the hover board.

Floor for Standard Farrowing Pen.

Fig. 1 shows a sketch of the standard type concrete-floored 8 ft. x 8 ft. farrowing pen with a wooden sloping floor measuring 8 ft. x 5 ft. The latter has a fall of 8 inches to the back wall. The wooden floor is made in three sections to facilitate lifting for cleansing purposes. The ramp in front need be only one foot wide for the small pigs to run up. A ramp may not be necessary where advantage is taken of sloping ground.

Value of the Brooder Lamp.

The efficiency of the sloping floor is further increased by using a brooder lamp installed to throw heat down through a hole

in the top of the hover board. On farms where electric power is available, a 150-watt electric lamp gives good results; in warm weather this may be reduced to 60 watts. The newly-born pigs gravitate to the lowest part of the floor, under the hover-board, where they are quickly dried out by the lamp and thereafter kept warm and contented. The lamp not only helps to save pigs, but also makes it entirely unnecessary for the pig-raiser to sit up at nights to watch over farrowing sows. This is a great boon in itself, especially on piggeries running a number of brood sows.

Management of the Sloping Floor.

The following points are important:—

1. The "fall" of the sloping floor should be 8 inches in 5 feet.

2. The floor should be made in three sections with boards running across the slope, 6 inches x 1 inch undressed hardwood being most suitable.

3. The floor boards should be spaced slightly apart, allowing a maximum of ¼ inch between each board. This allows for drainage, prevents fouling of the nest and gives a grip for the sow's feet.

4. The hover board on the back wall, 12 inches wide and 10 inches off the floor at the front, should be strongly braced, as the sow puts considerable weight on it when rising.

5. The hover lamp must be protected from the sow by a strong guard of wooden boards or rails.

6. Only a reasonable amount of straw for bedding should be provided. Too much straw spread on the sloping floor quickly works down the slope and is jammed tightly under the hover.

7. The wooden floor should be lifted each time a litter is removed from the pen and a thorough cleansing given the woodwork and the concrete floor below. In some cases more frequent cleansing of the concrete will be necessary.

8. A gate or hurdle across the front of the sloping floor allows the sow to be shut in at will, thus preventing any possibility of a farrowing on the outside concrete.

9. Lengths of 3-inch x 2-inch hardwood on edge, bolted to each side wall 10 inches above the floor, will serve as farrowing rails.

10. The sow should be accustomed to the sloping floor for several days before farrowing, and kept on it with her litter for seven to ten days after farrowing. The sow and litter may then be moved to another pen, preferably to a run of clean pasture.

Good Results in U.S.A. and Locally.

In a leaflet published by the Kentucky University, it is claimed that on Kentucky farms where records had been kept for 385

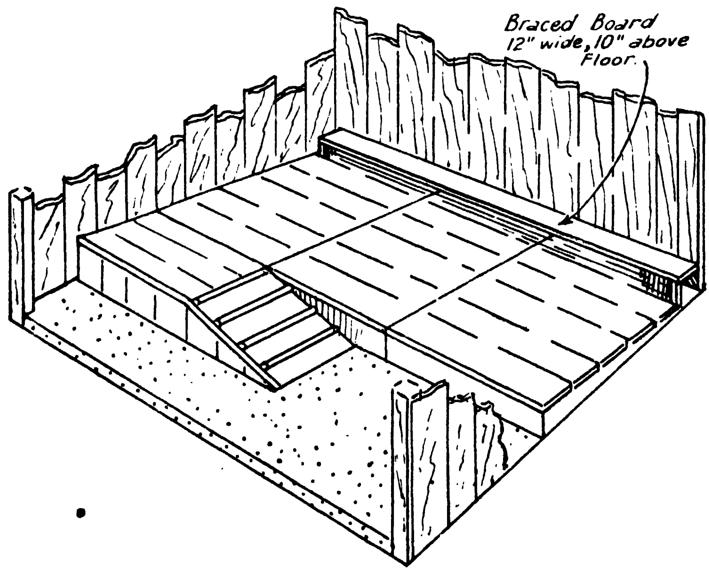

Fig. 1.—Sketch showing Sloping Floor and Hover Board Fitted in a Standard Farrowing Pen.

The three-sectioned floor is 8 feet by 5 feet with a fall of 8 inches to the back wall. The ramp need only be 1 foot wide.

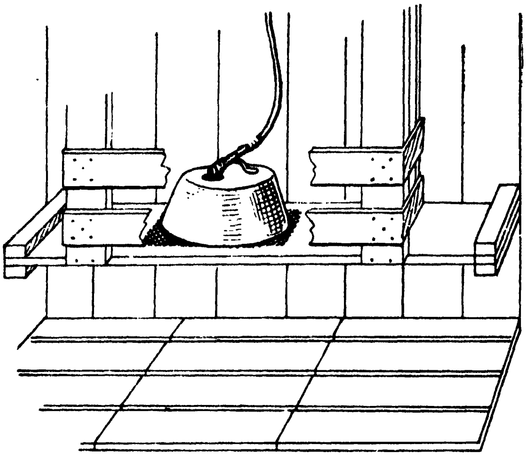

Fig. 2.—Sketch showing Details of Hover Board and Brooder Lamp.

litters, only one pig out of thirty farrowed on sloping floors had been overlaid by its dam. On the same farms, on level floors, nearly one pig out of four had been crushed.

Equally good results have been obtained on the farm of one of the authors (T. C. Newman) at Glenorie, New South Wales, where he has also found that total losses from all causes have been greatly reduced by the warmth and dryness provided by the Kentucky pen. Other local farmers, who have adopted this type of pen, give similar reports. A sloping floor at Hawkesbury Agricultural College has also proved an unqualified success.

With a view to increasing production and at the same time lowering production costs, all pig-raisers are urged to instal sloping farrowing floors forthwith, and to use brooder lamps where possible. They can be assured that the results will more than justify the cost of installation.

Acknowledgment.

We are indebted to Leaflet 98 of University of Kentucky College of Agriculture for much of the technical information used in this article, and also for the illustrations which have been adapted to local conditions.

Fig. 3.—Sections of Sloping Floor Removed for Cleaning.

Agricultural Courses Available at Sydney Technical College.

DURING recent years a wide range of courses has been developed at Sydney Technical College covering the various branches of agriculture and horticulture.

Certificate courses of three years' duration are offered to those engaged in agriculture and horticulture or an allied occupation. These provide both practical and theoretical training, including the most modern scientific and technical developments in these fields. They are part-time courses available both by day and evening.

The general educational standard for admission is the Intermediate Certificate or its equivalent and persons of any age may apply. The fee for a Certificate course is £3 3s. per year in advance.

Special courses are provided for those students with particular interests. Among these courses are: Poultry Farming, Dairy Technology, Greenkeeping, Garden Design, Forestry and Wood Technology. The fee for such courses is £1 5s. per year in advance.

Applications for enrolment in the 1949 session should be lodged during the week, commencing 21st February, 1949. Further details of these courses may be obtained from the Principal, Sydney Technical College.

TOMATOES showing symptoms of suspected molybdenum deficiency were located at Berkeley Vale in the Gosford district last month by R. D. Wilson, Plant Pathologist of the Department of Agriculture.

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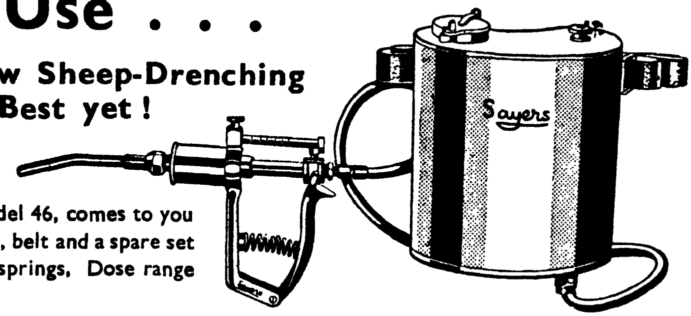

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SELECTION OF CITRUS BUDWOOD TO CONTROL SCALY BUTT In Trifoliata Rootstock.

CONTRIBUTED BY THE TRIFOLIATA IMPROVEMENT COMMITTEE.*

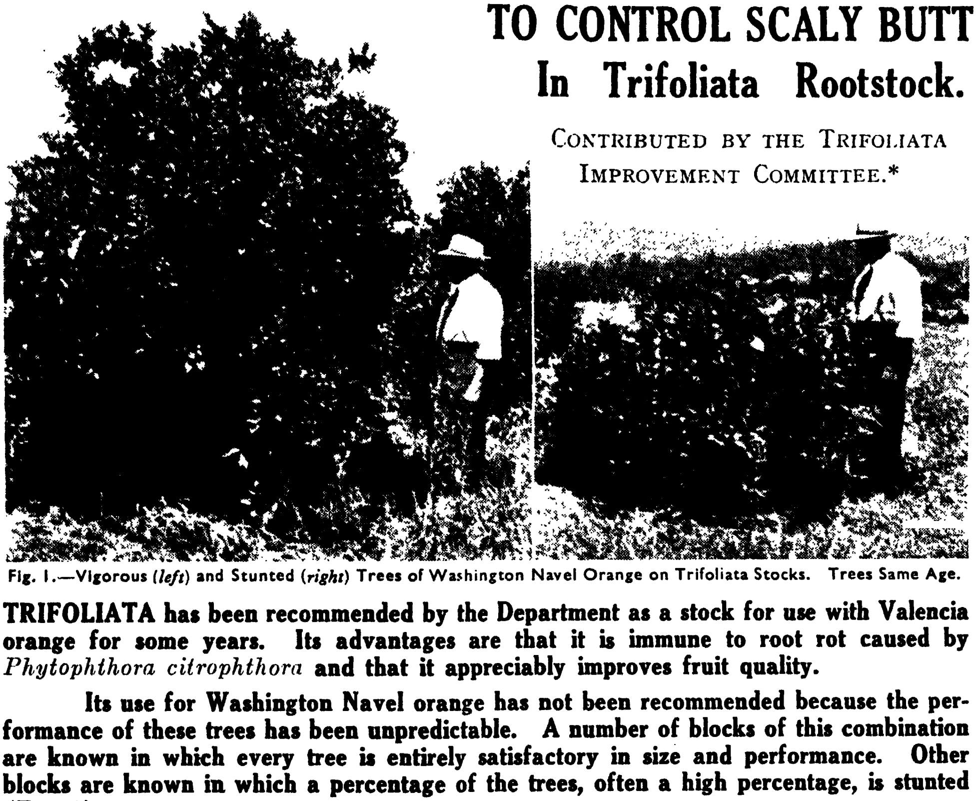


Fig. 1.—Vigorous (*left*) and Stunted (*right*) Trees of Washington Navel Orange on Trifoliata Stocks. Trees Same Age.

TRIFOLIATA has been recommended by the Department as a stock for use with Valencia orange for some years. Its advantages are that it is immune to root rot caused by *Phytophthora citrophthora* and that it appreciably improves fruit quality.

Its use for Washington Navel orange has not been recommended because the performance of these trees has been unpredictable. A number of blocks of this combination are known in which every tree is entirely satisfactory in size and performance. Other blocks are known in which a percentage of the trees, often a high percentage, is stunted (Fig. 1).

It is considered that these variable results with Washington Navel are due to the incidence of a virus, and therefore, in propagation, every care should be taken to select budwood which is free from virus.

Scaly Butt.

Associated with the stunting in most cases is a condition known as scaly butt. This is caused by the splitting and flaking of the bark of the stock (Fig. 2). In such cases the stock is of much the same diameter as the scion, whereas in good combinations the stock greatly outgrows the scion (Fig. 3).

The same condition occurs, to a varying degree, when grapefruits or lemons are worked on Trifoliata and has been seen, though extremely rarely, with Valencia as the scion.

The occurrence of scaly butt, particularly with Washington Navel as the scion, has been known for over twenty years in New South Wales, but it was in 1938 that a planting of Washington Navel on Trifoliata, then about thirty-five years of age, was first

* The Committee consists of Mr. R. J. Benton, Principal Fruit Officer (Extension) [until recently Special Fruit Officer (Citrus)], Drs. F. T. Bowman, Special Fruit Research Officer (Convener), and Lilian Fraser, Plant Pathologist, and Mr. R. G. Kebby, Special Fruit Officer (Citrus). The authors wish gratefully to acknowledge the assistance of growers referred to in this article as well as that of officers of Narara Nursery and Mr. E. C. Levitt, Fruit Officer, and Mr. A. C. Arnot, Fruit Inspector.

located (R.J.B.), in which all the trees were free of dwarfing and scaling and were highly satisfactory. Prior to this it was thought that Washington Navel on Trifoliata was always subject to dwarfing and the stock to a variable amount of scaling.

Fig. 2.—Dwarfed Washington Navel Orange on Trifoliata Stock (eight years old) showing Scaly Butt.

Note scaling extends to union; frequently it appears only at ground level.

In 1943 a committee, comprising officers of the Division of Horticulture and the Biological Branch, was set up to find improved propagational methods with this rootstock and scion budwood, as well as to undertake double, reciprocal and other workings. An investigation of the source of stocks and budwood in relation to the field problem was undertaken. Propagations previously initiated by one of the committee (R.J.B.) were also reviewed within the scope of the investigations, and it is some of these workings which are discussed in the section "Experimental Development of Scaly Butt."

Investigations have reached the stage at which it can be said that the choice of budwood appears to be of first importance, as there is experimental evidence that scaly butt is due to a virus communicated to the stock from affected budwood. The stocks, being of seedling origin are, in all probability, virus free.

The investigations have been concerned mainly with Washington Navel, but the findings may apply equally well to those other varieties of citrus which are well known to produce scaly butt on Trifoliata understocks.

Scaly butt is known in the United States of America, where Dr. A. F. Camp, Vice-Director, Citrus Experiment Station, Lake Alfred, Florida, in private communication dated 14th August, 1944, stated that scaling occurs in Louisiana, but that dwarfing without scaling occurs in Florida. He also recorded having seen some scaling of Trifoliata stocks in Argentina in one section, whilst in another section, the Concordia section, Trifoliata stock produced outstanding trees free of dwarfing and scaling. In a recent short article, Fawcett and Klotz[1] record scaling of Trifoliata in California and state "the nature or cause of exocortis (as scaly butt is called in California) is not known. It is believed that it is either due to a genetic factor . . . or that it is due to a virus."

Experimental Development of Scaly Butt.

1. *Inarches.*—Early results from a series of inarched Washington Navel trees first suggested the view that the scion wood is of paramount importance. In October, 1943 and 1944, dwarfed four-year old Washington Navel trees on Trifoliata stocks, in the orchard of Mr. W. Barrett, Dooralong, New South Wales, were inarched with Trifoliata seedlings. Two inarches were put on to the Washington Navel scion of each tree.

In January, 1948, by which time the inarches were four to five years old, it was observed that scaling had developed on several inarches attached to scaly-butted trees. One inarch on five trees, and both inarches on another tree, were so affected, out of a total of twenty-nine scaly-butted trees inarched. No scaling had developed in inarches attached to the Washington Navel on non-scaling Trifoliata stocks.

2. *Use of Scaly-butted and Non-Scaly-butted Budwood.*—The influence of budwood in Washington Navel was shown on a number of trees propagated in 1941 on Trifoliata stocks. The budwood was taken from two sources:—

(*a*) Scaly-butted dwarf tree of Washington Navel orange on Trifoliata; and

(*b*) Non-scaly-butted good tree of the variety, on similar stock, growing in the block referred to earlier as being the first block of completely good trees located.

The Trifoliata rootstocks used for the young trees were raised from the seed of two Trifoliata trees growing at Narara Nursery. The trees were planted out in spring, 1942, as one-year old trees, on the orchard of Mr. L. A. Roberts, Narromine, New South Wales.

Observations were made on the trees in July, 1948, when the trees were six years old, as by this age scaly butt has usually developed to an extent which will give a reliable indication of the future state of the trees with regard to this condition. Of fourteen trees propagated from tree (*a*), 50 per cent. were scaly butted, whilst of seventy-five trees derived from tree (*b*), 8 per cent. were scaly butted. As well as showing the low percentage of scaly butt, the trees propagated from non-scaly-butted wood were decidedly more vigorous.

3. *Top-working.*—Scaling has developed in some Trifoliatas which were top-worked by budding on to a Thompson Navel orange. The Trifoliata buds were taken from suckers specially selected from non-scaling stocks with Washington Navel top, or from unworked Trifoliata seedling trees, and were inserted in October, 1937, into a Thompson Navel tree on Rough Lemon growing at Narara Nursery. The work was duplicated on a second tree.

Several of the workings died, but seven selections had survived in 1948 and made satisfactory growth. In September, 1948, it was found that two of the selections on one tree had developed scaling, indicating the presence of the virus in the Thompson Navel tree and its transfer to the Trifoliata where it had induced scaling. By November a third section was developing scaling.

The Orchard Position.

As mentioned earlier the position with Washington Navel on Trifoliata is that some plantings are affected with scaly butt and dwarfing to an extent which may vary from a few trees being affected, to many or the majority of the trees being affected, whilst other plantings are known in which all the trees are not only not affected, but are good trees, and comparable with or approximate to the growth which could be expected on Rough Lemon rootstock.

From the extensive surveys which have been made it has not been possible to ascribe these differences to any particular source of the rootstock which may have been in use by nurserymen. The survey shows, in part, that the sources of rootstock must be tested individually to secure an answer to this side of the problem. However, with the present evidence that a virus is involved, an explanation for the different types of groves is readily found in customary nursery practice.

Washington Navel budwood is most commonly obtained from trees on Rough Lemon stocks, a combination which affords no indications as to whether or not the Washington Navel wood is affected with the virus causing scaly butt. The frequency with which the variable type of planting occurs in the field surveys, indicates that many sources are affected. Occasionally, however, uninfected wood has been used and so has given rise to the occasional good

Fig. 3.—Vigorous Washington Navel Orange on Trifoliata—Forty-five Years Old.

Note overgrowth and ribbing of the stock.

grove; in cases where the propagational history of good groves is known, the Navel wood was taken from trees on Rough Lemon. It is now considered that all budwood of Washington Navel for use on Trifoliata should be taken from sources which have stood the test of having been worked on Trifoliata, viz., good trees themselves on Trifoliata stock.

Conclusions and Recommendations.

The development, in experiments, of scaling on Trifoliata from union with scaly-butted Washington Navel scion, points to the transfer of a virus from the affected scion to the free Trifoliata, as the cause of scaly butt.

In the realm of practical propagation these results indicate that all budwood for use on Trifoliata stock should be obtained from good trees of the varieties required growing on non-scaling and non-dwarfing Trifoliata understock. These trees should be at least eight to fifteen years of age in order that they will have had time to demonstrate adequately their response to Trifoliata stock. Budwood of Washington Navel (and probably the other citrus varieties which produce scaling in combination with Trifoliata) should not be used if growing on Rough Lemon or other stocks, as these combinations yield no evidence, so far as is known at present, of the likely reaction of that budwood when worked on Trifoliata.

Reference.

[1] Fawcett, H. S., and Klotz, L. J.: Bark shelling of Trifoliate Orange. *Calif. Citrog.* 33:230, Apr., 1948.

Selected Citrus Buds.

The Co-operative Bud Selection Society, Ltd.

FOR some years it has been recognised that in most citrus groves there are trees that rarely produce sufficient fruits to be payable, whilst other trees are more constant producers of good quality and payable crops. With a view to enabling nurserymen to supply trees of the most productive and remunerative standards to planters, the above Society was formed under the aegis of the Department of Agriculture, and consists of representative fruitgrowers and nurserymen. The Society does not and cannot make profits, but merely exists to improve the fruit-growing industry by making available for budding selected buds from special trees of the best type of quality fruit and of reputed good bearing habit only. Trees from such buds should undoubtedly be more profitable and appeal to all progressive orchardists.

The Co-operative Bud Selection Society Ltd. supplied the following selected buds to nurserymen during the 1948 budding season, trees from which should be available for planting during the 1949 season:—

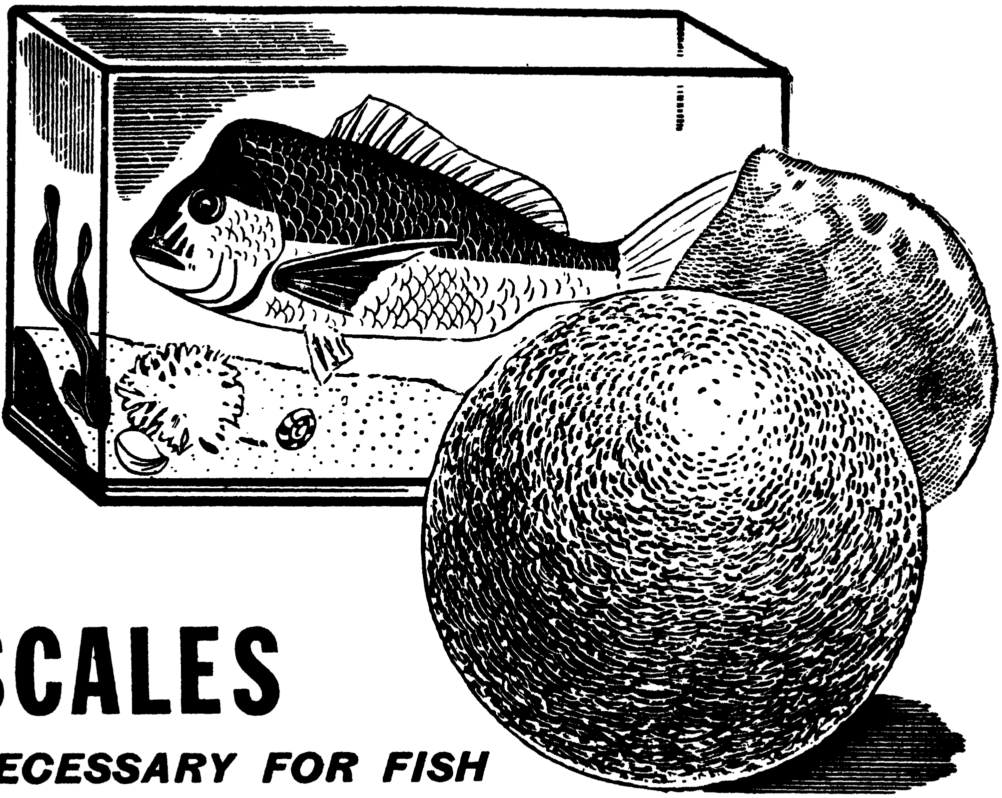
Grower.	Total.	Washington Navel.	Valencia Late.	Eureka Lemon.	Lisbon Lemon.	Marsh Grapefruit.	Wheeny Grapefruit.	Emperor Mandarin.	Joppa Orange.	Imperial Mandarin.	Thorny Mandarin.	Ellendale Mandarin.
Anderson & Co., Carlingford ...	51,000	14,000	26,500	4,000	...	3,000	1,000	2,500	...	...	...	...
F. D. Catt, Carlingford	55,000	19,500	30,000	4,000	500	1,000	...	...	...	...	...	...
A. T. Eyles, Rydalmere	15,000	5,000	8,000	500	500	1,000	...	...	...	...	...	...
H. Cambourn, Gosford	21,100	9,000	12,000	...	...	...	...	100	...	...	...	...
A. C. Arnot, Terrigal...	17,700	3,000	14,700	...	...	...	...	...	...	...	...	...
F. E. Spurway & Sons, Ermington...	10,000	3,000	5,000	500	...	1,500	...	...	...	...	...	...
E. H. Ferguson, Wyong	7,700	2,250	2,000	1,500	500	250	...	500	250	200	250	...
A. J. Aspinall, Turramurra	4,500	500	3,800	200	...	...	...	...	...	...	...	...
A. Turner, Terrigal	5,100	2,000	3,100	...	...	...	...	...	...	...	...	...
Tall Timbers Nurs., Doyalson ...	3,350	2,100	1,100	...	...	75	75	...	...	...	...	...
J. Ferris, Rydalmere	6,400	2,500	3,300	...	...	...	...	600	...	...	...	...
T. Adamson, Ermington	19,500	4,000	12,000	2,000	...	250	250	1,000	...	...	...	...
Premier Nurseries, Yoogali	10,000	4,000	4,000	600	400	400	100	300	...	...	100	100
A. Smith, Rydalmere	5,250	2,000	2,750	500	...	...	...	...	...	...	...	...
F. Cottman, Wamberal	1,200	...	1,200	...	...	...	...	...	...	...	...	...
B. McKenzie, Lisarow	1,000	300	700	...	...	...	...	...	...	...	...	...
C. O'Toole, Somersby	500	500	...	...	...	...	...	...	...	...	...	...
F. B. Haines, Castle Hill	2,000	500	500	...	...	500	...	...	...	...	250	250
P. J. Heaton, Manly	700	700	...	...	...	...	...	...	...	...	...	...
A. N. McDonald, for New Zealand...	300	100	...	...	...	...	100	...	...	...	100	...
C'tee of Direction, Queensland ...	17,000	...	17,000	...	...	...	...	...	...	...	...	...
	254,300	74,950	147,650	13,800	1,900	7,975	1,525	5,000	250	200	700	350

THE following information on apples exported to India was received recently from the Commonwealth Department of Commerce and Agriculture:

"Recent advice from the Australian Trade Commissioners at Calcutta and Bombay indicate the following preferences:—

"Sweet deep-red varieties of apples, of 2¼ to 3 inches in diameter. Only at times of extreme shortage are sizes up to 3½ inches acceptable.

"Green and yellow varieties, including Granny Smith, have very little appeal except to the small European community."



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A Consideration of—

THE FRUIT FLY PROBLEM

and

SOME DETAILS OF RECENT CONTROL TESTS.

A. H. FRIEND, B.Sc.Agr., Entomologist.

FOLLOWING the previously reported experiment[1] in Narrabeen plums, in which D.D.T. sprays gave almost as good results as the usual tartar emetic bait, a series of field and laboratory trials were performed against adults of the Queensland Fruit Fly (*Strumeta tryoni*). This work has verified past experience and indicates that newly-developed organic insecticides possess possibilities for the control of the fruit fly.

THE FRUIT FLY PROBLEM—AN EXPLANATION.

Natural Activity or Seasonal Intensity.

Although the distribution and the abundance of Queensland fruit fly have increased, from negligible proportions, over the past fifty years, damage to a crop of fruit appears to be under the influence of factors which are enumerated below:—

1. *Climatic and Weather Conditions.*—Temperature, humidity, rainfall and wind, taken together, govern the yearly rise and fall in population of fruit flies and govern their distribution, in some years, to areas where they are not normally known to survive.

Optimum and lethal temperatures and humidities do not appear to have been established for our Queensland flies, although the effect of these factors on fruit-stinging is generally recognised. Allman[2] has reported on flies declining to feed on syrup at low temperatures and mortality in the field of larvae in the fruit due to abnormally high temperatures[3].

The interaction of these practically inseparable natural factors will have its effect on the available population of adult flies in relation to the size of crop and the actual vitality of the flies. It is recognised that adult flies may be affected adversely either directly, or indirectly through malnutrition of the larvae. Such influences must naturally affect the urge to lay eggs. Reduction in the number of eggs laid and poor viability of eggs have already been shown to follow the ingestion of sub-lethal doses of poison foliage sprays[4,5].

2. *Acceptability of the Crop.*—Ripening fruit will attract flies because either the fly prefers to feed in the crop or because the fruit best satisfies requirements for oviposition, or both, or else there may be insufficient choice of other possible host fruits in the vicinity and unusual oviposition records may be obtained (*e.g.*, grape). Hely[6] has reported a case where "fully-ripe plums were free of fly although the branches were intermingled with an adjacent apple tree whose fruits were totally infested."

While adult flies may prefer one fruit in which to oviposit, it is possible that they feed and prefer the environment of other plants in the vicinity without infesting the fruit of the latter.

Our knowledge on the local fruit fly does not yet allow sufficient analysis of the factors governing behaviour, but, although the problem is never exactly the same in any two years, experience has shown that reasonably reliable short-range predictions on likely infestation can be made in late summer and autumn crops.

Control of Adult Flies.

Two methods of insecticide application have recently been accepted—

(*a*) The cover spray which has come into use with DDT and involves an almost continuous deposit of insecticide. However, varying degrees of coverage and concentration have been used with varying success.

(*b*) The sugar bait method which has been used with various insecticides and generally involves limited coverage of the

tree—perhaps only one branch of each tree being treated. However, study by competent observers has shown that the sugar bait has little in the way of attractant qualities except insofar as a fly happens to come, in the normal course of its movement through a tree, into actual contact with the syrup, when its feeding reactions are involuntary. It follows that a wide distribution of bait throughout the foliage gives best protection, and it is generally recognised that coarse droplets as applied with the flick of a brush are most effective.

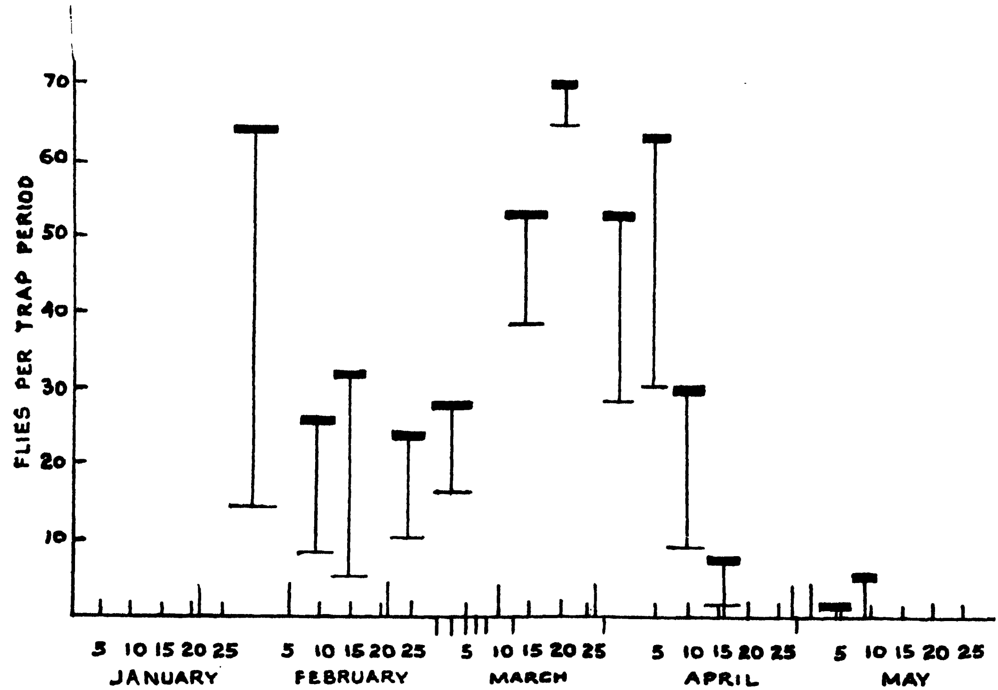
With either method, application from below the branches seems desirable from the point of view of permanence against weathering and deposition in the sheltered parts most frequented by fruit flies.

Control in Relation to Intensity of Fly Activity.

In the crop of ripening fruit where insecticidal control measures are being attempted, the degree of satisfaction expressed by the grower is generally related to the percentage of clean fruit. Even without control it is sometimes possible to obtain clean fruit, the activity of the fly in the crop being nil, due to an extreme of one or more of the governing natural factors described above.

With or without control measures it has been assumed without proof that the percentage of clean fruit ripened was largely dependent upon the intensity of the fly in the crop at the susceptible period, and this intensity was closely connected with seasonal balance amongst the natural factors governing the fly. To the practical grower a seasonal balance of weather conditions in favour of intense fruit fly activity has meant more active control work in order to offset the former. It is considered that a warm, relatively humid season is best suited to fly activity.

At the same time there may be seasonal conditions directly affecting the control programme—for example, very high humidities are reported[7] as lessening the value of a

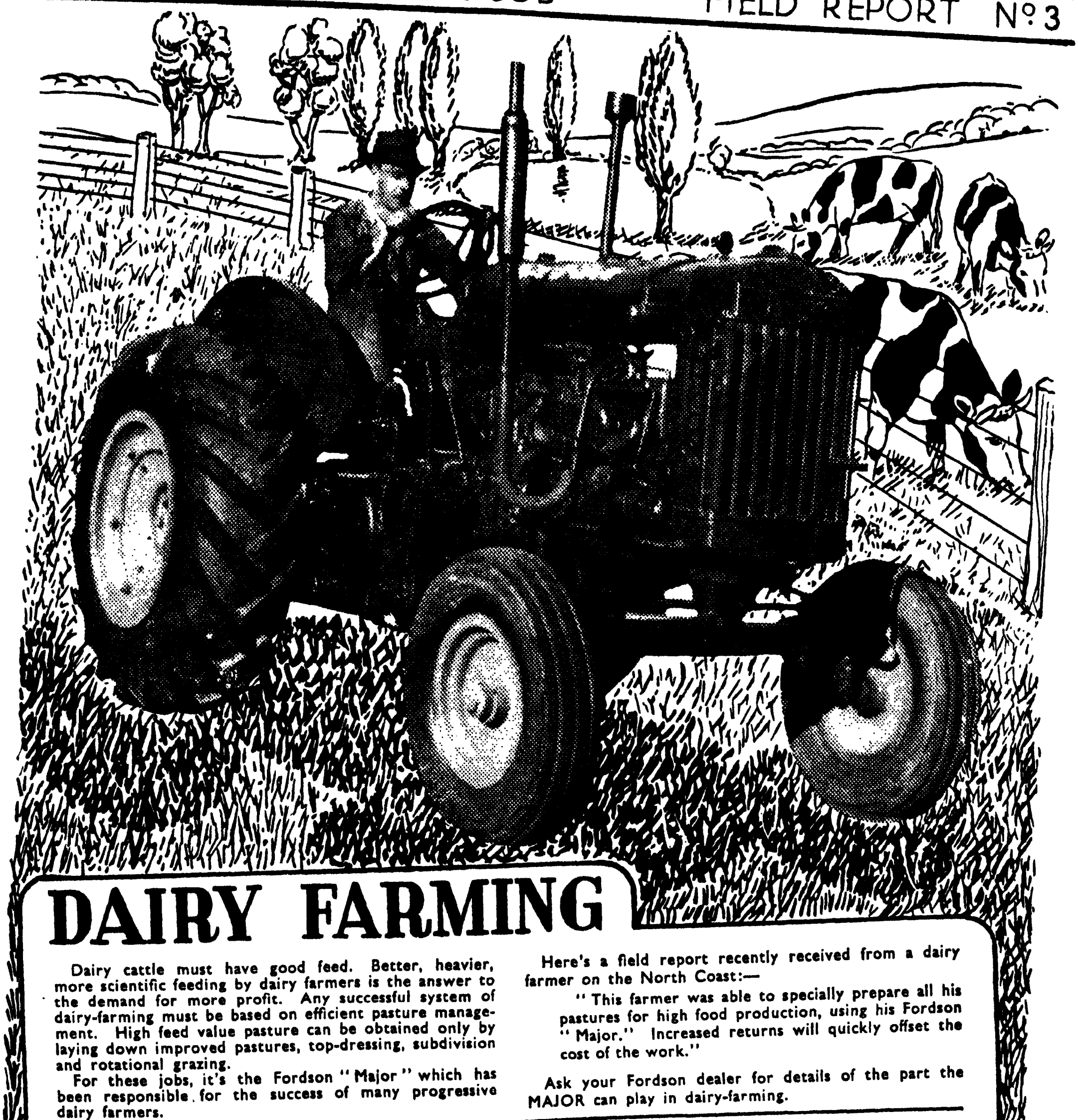


Results by Plummer 1936 for Counts of Flies in each of Thirteen Trapping Periods as Affected by Five tartar-emetic Bait Sprays.

The upper horizontal line covering each trapping period represents numbers of flies captured in twenty-four traps on the control plot, and the lower horizontal line in each case represents numbers in 24 traps in the sprayed plot. The longer vertical lines at the bottom of the figure indicate the dates of spray applications and the incidence of rainfall is represented by short lines projecting below the base line.

[*Adapted from Baker et al.*

THE MAJOR ON THE JOB ... FIELD REPORT No. 3



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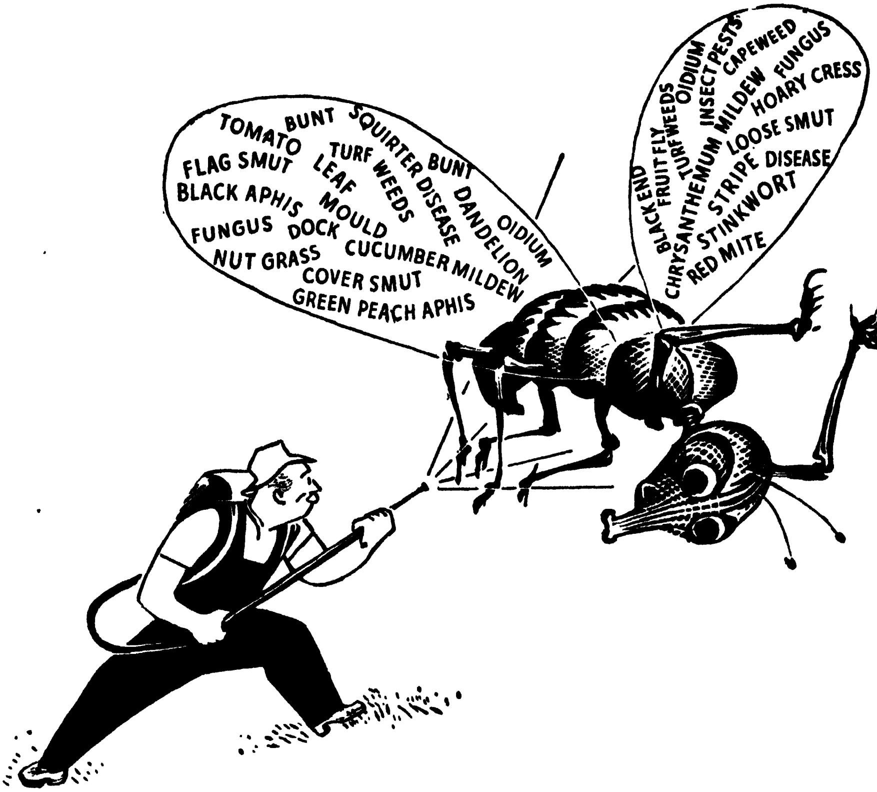

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J3-24

Black-leaf 40-sugar bait, and it is often considered that rainfall removes sugar baits which must be replaced.*

Barrett[8] pointed out in 1933 that: "Economic entomological literature is filled with references to control measures in which results are given as per cent. insect-injured fruit, or other portion of the plant in treated plots in contrast to non-treated plots. Such a method is often employed to express population trends over a period of years. Expression of results by this method, especially when different years are under consideration, is open to a number of gross errors, as only the ratio of occupied to possible occupied host sites is given. As both the population of insects and the number of host sites, *i.e.*, yield, vary from year to year and plot to plot, per cent. figures give only the ratio between these two variables."

Dealing with codling moth infestation of walnuts, Barrett showed that, over a number of years, an annual treatment with lead arsenate produced a degree of control or percentage of clean fruit which varied inversely with the annual increase or decrease in moth population, which itself varied under natural influences.

A figure is included here to show results by Baker *et al.*[7] on reductions in populations of adults of the Mexican fruit fly† due to applications of a tartar emetic bait in a plot of young oranges in which the flies were not very numerous.

It will be noted that:

1. Generally speaking, a considerable reduction in flies was obtained with an infrequent application of tartar emetic bait, under conditions of stated low fly population.

2. A breakdown in control during March was associated with rainfall (stated not heavy). The schedule adopted was not intense enough to achieve control under the conditions.

3. For most of twelve trapping periods where a comparison with the previous catch is available, an increase or decrease in the untreated plot occurs with similar changes in the treated plot.

4. If one calculates the percentage reduction in flies for each of the thirteen trapping periods, the approximate figures are, 77, 72, 83, 58, 44, 29, 7, 42, 52, 64, 75, 100, 100, and the conclusion must be that, with fruit flies, there can be no valid comparison of degrees or percentages of control obtained under different conditions, unless population intensity and other factors governing control measure effectiveness can be accounted for and appropriate corrections applied.

Attention has been devoted to these aspects of the fruit fly problem since it seemed necessary to offer reasons for large differences in results with any one control method, which have led to a considerable diversity of opinion as to the usefulness of different compounds. In addition, it seemed desirable to indicate the complexity of the problem so that readers may appreciate some of the difficulties confronting those who would attempt to obtain undisputed and generally applicable results from a field experiment on fruit fly control.

RECENT EXPERIMENTS RELATED TO FRUIT FLY CONTROL.

From the experiment reported by Allman and Friend[1], in which slow-killing insecticides were used, it was concluded that progress in adult fly control might best be secured with improved sugar baits. A small field experiment, from 27th January to 26th February, 1948, with China pears at St. Ives, where ten standard tartar emetic-sugar bait applications were compared with three 0.2 per cent. DDT cover sprays, further upheld this view—because of the differences in average number of stings per fruit, viz. :—

Tartar emetic-sugar bait ..	1.7
DDT cover spray	4.2
No control measure ..	4.7

There was no worthwhile harvest of clean fruit from any treatment, showing clearly that both control schedules were, for practical purposes, out of balance with the intensity of fly activity during this period in this fruit. However, it may be remembered that conditions under which the experiment with Narrabeen plums[1] was carried out were such that reasonable

*Allman and Friend[1] reported satisfactory reduction of stinging in Narrabeen plums with a tartar emetic-sugar bait, in spite of twenty-one wet days in an application period of forty-two days.

†This fruit fly has comparable behaviour and importance to the fruit fly in this country.

protection was obtained with both tartar emetic-sugar bait and DDT cover sprays.

Individual thickets of blackberries were later variously treated, from 27th February to 7th March, 1948, either with four DDT cover sprays, or with daily splashings of one of the following three baits: tartar emetic-sugar, HETP-sugar‡ or Blackleaf 40-DDT-sugar.

On 8th March, 1948, complete control with all four treatments was found, while 34 maggots were obtained from 200 ripe fruits picked in a thicket not treated.

HETP-sugar, being a new mixture, was further tested in early April. In the first test droplets placed on citrus leaves were found to be rapidly effective against flies in the laboratory for at least 23 hours. A second test was made by splashing two fig trees with the HETP-sugar bait§, observations being made of flies dropping on to tarpaulins spread under the trees. From one tree, during the first daylight period subsequent to baiting, 98 fruit flies (71 within the first hour) were found on the tarpaulin; 5 flies were recorded in the second daylight period and none during the third. Somewhat smaller number of fruit flies but of similar distribution were obtained during two days from the second tree. When, however, a second application of the bait to the second tree was made on the third day, large numbers of fruit flies were found dead on the tarpaulin spread under this tree. At no time were fruit flies found to recover from HETP-sugar in this test.

Since weather conditions, as recorded for temperature and humidity, were practically identical on these three days, it was concluded that diminution in counts of drop after about 30 hours following the first application was due to loss in efficiency of the bait¶

‡ A mixture said to be hexaethyltetraphosphate.

§ This bait was "Hexone," 1 c.c.; sugar, 1 oz.; water, 1 pint.

¶Large numbers of other insects, including fruit beetles (*Nitidulidae*), and slaters were brought down dead by this treatment for periods recorded up to 32¾ hours. By increasing the strength of the bait longer residual effect was noted.

||I am indebted to officers of the following firms for samples of phosphatic insecticides: Geigy Australasia (Pty.) Limited, Henry H. York & Co. Pty. Ltd., and William Cooper and Nephews Pty. Ltd.

At this stage it was considered that HETP had bridged a big gap in the known methods of fruit fly control insofar as flies succumbed after treatment more rapidly than ever before. As further additions had been made in the phosphatic group of insecticides, and it seemed likely that others of the group would have better lasting qualities, comparative trials of these substances|| were continued in the warm room of a glasshouse.

In these tests, emphasis was laid upon the lasting effect of sugar baits. For this purpose potted citrus trees were kept in the glasshouse and drops of bait applied to the leaves. All baits contained the standard 6.3 per cent. sugar and the control bait was sugar alone. Baited leaves were picked as required, placed for trial in tubes into each of which two or three flies were then caught, and the tube stoppered with cotton wool moistened with a drop of water. All treatments were replicated and it is considered that differences recorded are significant.

The results of one experiment are summarised below:—

Bait.	Insecticide dilution.	Period in days between application of bait and commencement of trial.	No. of hours after trial commenced at which at least 50 per cent. mortality observed.
Check—sugar ...	—	3	120
Blackleaf 40 plus sugar	1–500	3	½
do	1–500	3*	48
Tartar emetic plus sugar	1–320	3	21½
do	1–320	3*	21½
3422 † plus sugar ...	1–3333	21	21
do	1–3333	13	21
do	1–3333	3	½
do	1–3333	3*	21
TEPP ‡ plus sugar ...	1–500	21	120
do	1–100	21	120
do	1–500	13	21
do	1–500	3	½
do	1–500	3*	21
HETP plus sugar ...	1–500	21	120
do	1–100	21	21
do	1–500	13	21
do	1–500	3	½
do	1–500	3*	21

* Sugar bait kept as solution for 3 days and applied to leaves shortly before offering to flies.

† Also called "E 605," "thiophos" or "parathion" and claimed to be di-ethyl o-paranitrophenyl thiophosphate or close relative.

‡ Tetra ethyl pyro phosphate.

A further trial yielded the following results:—

Bait	Insecticide dilution	Period in days between application of bait and commencement of trial	No. of hours after trial commenced at which 50% knock-down	50% mortality	100% mortality
Check—sugar ...	—	8	—	144	>240
Blackleaf 40 plus sugar ...	1–500	8	0·5	2·3	4·0
Tartar emetic plus sugar ...	1–320	8	6·5	6·5	6·5–24
TEPP plus sugar ...	1–500	8	0·25	0·5	4·0
HETP plus sugar ...	1–500	8	2·0	2·25	6·5
3422 plus sugar	1–3333	8	0·25	0·5	2·5

As the above work occurred under reasonably controlled conditions it was concluded that, considering all points of appraisal, "3422" was the most promising substance yet used in a sugar bait against fruit fly adults.

A report concerned with dosage mortality by Lepage, Giannotti or Orlando[9] in Brazil showed that an organic phosphate, presumed identical with 3422, was active at the low dilution of 1 part to 200,000 when offered to adults of the Mediterranean fruit fly in a 50 per cent. honey solution.

Efforts were made to continue residual activity tests with the sugar deposit containing 3422 at 1–500 on citrus leaves in the glasshouse. The last batches of the flies available were used up in September on bait applied to leaves 52 days previously. Within six hours all flies in the 3422 treatment had died, whereas all check flies remained alive for a considerable period.

References.

[1] ALLMAN and FRIEND. *N.S.W. Agr. Gaz.*, October, 1948. p. 531.

[2] ALLMAN. *N.S.W. Agr. Gaz.*, April, 1942. p. 186.

[3] INSECT PEST NOTES. *N.S.W. Agr. Gaz.*, March, 1939. p. 152.

[4] ALLMAN. *Jour. Aust. Inst. Agr. Sci.* 6, 1940. p. 211.

[5] PLUMMER and BAKER. *Jour. Econ. Ent.*, 39: 6, 1946. p. 775.

[6] HELY. Departmental report for month of December, 1947.

[7] BAKER, STONE, PLUMMER and MCPHAIL. U.S.D.A. Misc. Publn. 531, October, 1944.

[8] BARRETT. *Jour. Econ. Ent.*, 26. 1933. p. 873.

[9] LEPAGE, GIANNOTTI and ORLANDO. *Fruits d'outre mer.* No. 5, May, 1948. p. 181.

ABBOTT. *Jour. Econ. Ent.* 18. 1925. p. 265.

SUN and SHEPARD. *Jour. Econ. Ent.* 40. 1947. p. 715.

Forwarding Specimens for Examination.

ALL members of the public who from time to time forward specimens of plants, fruit, vegetables, insects, etc., to the Department of Agriculture, are asked to observe the following necessary precautions:—

(1) The package should be securely wrapped and tied with strong string, with due regard to the contents.

(2) The nature of the contents of each package should be clearly indicated on the outside of the package. Name and address of the sender must also be shown.

(3) A separate letter in relation to the specimens forwarded should always be addressed to the Department.

Observance of these precautions will be a direct help to the Department in furnishing the information sought. Many packets and parcels are received daily by the Department, and much time can be saved if these articles when received can be immediately directed to the Divisional authorities concerned without the necessity of opening the packages.

Packages should be addressed clearly to the Under-Secretary and Director, Department of Agriculture, Box 36A, G.P.O., Sydney. Despatch should always be timed so as to arrive in Sydney before the week-end, in order that specimens may be in as fresh as possible a condition when examined. Postal "Express Delivery" service is available at small cost and helps assure that specimens arrive in a fresh condition.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albion Park	January, 14, 15
Dapto	January 21, 22
Lithgow	February 4, 5
Liverpool	February 5, 6
Luddenham	February 11, 12
Pambula	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 17, 18
Tenterfield	February 17, 18, 19
Candelo	February 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February, 18, 19
Cobargo	February 23, 24
Newcastle (P. Legoe)	February 23 to 26
Rylstone	February 25
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Coonabarabran (M. J. Hennessy)	March 1, 2
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Bega	March 3, 4, 5
Glen Innes	March 3, 4, 5
Comboyne (W. R. Cooke)	March 3, 4
Penrith (A. Tornaros)	March 4, 5
Mudgee (H. A. Marsh)	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Blayney (K. Gresser)	March 8, 9
Tumbarumba (Mrs. U. H. O'Shea)	March 8, 9
Cooma	March 9, 10
Blacktown	March 11, 12
Braidwood	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Moruya	March 11, 12
Gulgong (T. Amies)	March 12
Dunedoo	March 14
Gundagai (J. C. Saddler)	March 15, 16
Mendooran	March 16
Bombala	March 16, 17
Armidale	March 17, 18 19
Crookwell	March 17, 18 19
Binnaway	March 18
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Baradine	March 22, 23
Warialda	March 22, 23
Delegate	March 23, 24
Taralga	March 24, 25
Wauchope (L. Steel)	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Narrabri	May 5, 6
Grafton (C. C. Pitt)	May 5, 6, 7
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7
Orange (N. J. Aird)	May 5, 6, 7
The Rock (O. L. Boyd and A. F. Walker)	September 17

Approved Vegetable Seed—January, 1949.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—continued.

Cauliflower—

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

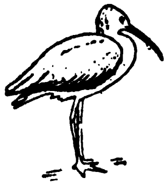
Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

The Dolomite With More Magnesium

"IBIS"  **DOLOMITE**

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18% MAGNESIUM (MgO)
36% $MgCO_3$

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INSECT PESTS.

Notes contributed by the Entomological branch.

White Wax Scale (*Ceroplastes destructor*).

WHERE citrus or other trees and shrubs were infested with white wax scale during last year, and control measures were neglected during the December oil-spraying period when the scales were in their immature stages on the leaves, it will now be necessary, in most instances, to use a soda spray to control them.. The scales, by now, will be on the twigs and covered with their protective waxy secretions.

In most seasons, the hatching of the eggs beneath the adult scales is practically complete by the middle of December in lowland orchards, but is usually a little later in the mountain areas. The young scales, after remaining on the leaves for about four to six weeks, make their way back to the twigs (about the end of December or early January) where they settle permanently. They increase in size and secrete wax more freely, until, some ten months later when fully-developed, they lay their eggs. There is only one generation of this scale a year.

As quantities of "honey-dew" are excreted by these insects, the leaves, stems or fruits may become covered with a sooty mould which develops on this sugary substance, if control measures are not adopted.

Soda Sprays.

The concentration required for the soda spray will depend upon the size of the scales at the time of application.

While the scales are still young, and in their "peak" stage, fresh washing soda at a concentration of 10 lb. to 40 gallons of water (1 lb. to 4 gal.), may be used to control them.

Where the scales are larger, and the wax is in the "dome" stage, it will be necessary to use from 12 to 15 lb. of washing soda to 40 gallons of water (about 1¼ lb to 1½ lb. to 4 gal.). Soda sprays are usually applied about February or March.

Soda ash may be used instead of washing soda, the equivalent amounts being:—For the "peak" stage, soda ash 3 lb. to 40 gallons (5 oz. to 4 gal.), and for the "dome" stage from 4 to 5½ lb. to 40 gallons of water (6½ to 9 oz. to 4 gal.).

Soda sprays may be injurious to the trees, and some leaf-fall may occur following their

Citrus White Wax Scale.

use. Where Bordeaux mixture has been applied the injurious action of the soda is likely to be increased.

Soda sprays, either alone, or in combination with oil, should not be added to Bordeaux mixture.

Where it is necessary to control other scales, such as red scale and purple scale, in addition to white wax, a white oil, at the rate of 1 gallon to 40 gallons of spray (16 fluid oz. to 4 gal.), may be combined with the soda. This combination, however, is likely to be followed by a certain amount of injury, especially to trees which have been sprayed with Bordeaux.

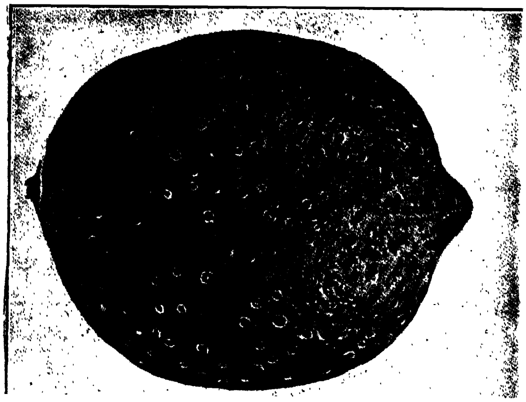
Where only white wax scale has to be controlled, the addition of either white oil or red oil, at the rate of ½ gallon to 40 gallons of soda solution (8 fluid oz. to 4 gal.), will ensure that the spray will spread satisfactorily. This quantity of oil also assists in the smooth working of the spray pump.

Red Scale (*Aonidiella aurantii*).

THE red scale is present in all the main citrus-growing districts and is the most injurious pest of oranges, mandarins and lemons, etc., in the inland districts and some parts of the coastal areas of New South Wales. It infests the leaves, fruit, twigs and branches, and if left unchecked is capable of causing whole branches to die back and may damage the trees so severely that they may be rendered entirely unproductive.

In addition to citrus, this scale also infests many other trees and shrubs, including mulberry, willow, holly, rose, grape, privet, etc.

The red scale is so called from the tough, protective reddish-brown, circular covering or scale which covers the body of the insect. Beneath this covering the insect develops, obtaining its food by sucking up the sap from the tissues of the infested plant.



Lemon Infested with Red Scale.

Living six-legged young or "crawlers" are produced and these, on emerging from beneath the parent scale-covering, crawl about for one or two days, and then settle down and commence to feed. The female remains fixed in the one place for the rest of its existence but the male finally emerges as a minute two-winged insect.

The average period from the birth of the female until the production of the next generation is about three months during warm weather, but a much longer period may elapse during the winter.

Control.

Fumigation with hydrocyanic acid gas is the most effective measure for the control of red scale. Details of this method are given in the Departmental pamphlet "Fumigation for the Control of Scale Insects of Citrus Trees," which may be had on application.

Control may also be obtained by spraying with a miscible or emulsified petroleum oil. These oils are of two main types, usually classed as white oils and red oils, and of these the white oils are the safest to use, being much less likely to damage the fruit or foliage.

These oils are used at a concentration of 1 gallon to 40 gallons of water (16 fluid oz. to 4 gallons). Soft water should be used if possible for mixing the red oils, or if the water is hard it should be softened by the addition of soap powder or washing soda.

Spraying may be carried out during February or March, but early application is preferable in order that the fruit during the process of expansion may have thrown off the scales by harvesting time.

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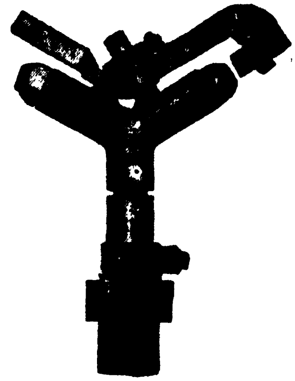

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Late applications of oil should be avoided as they are likely to cause a reduction of the crop the following season. Trees in a weak or drought-stricken condition are more susceptible to injury than trees that are healthy and vigorous, and if necessary, the spraying may be delayed. Injury to the trees may occur if they are sprayed during the heat of the day in very hot, sunny weather.

It is essential that the spray be thoroughly applied and that an adequate quantity be used so that all parts of the trees are thoroughly wetted.

Where red scale infestation is heavy it may be necessary to adopt a double treatment in order to obtain a satisfactory "clean-up," and for this purpose, either a double oil spray, or a combination treatment, in which oil spraying is followed by fumigation, may be used. The double spray method is more suitable for coastal districts, whereas the spray-fumigation treatment has been found more satisfactory in inland areas.

Where the double oil spray (1 to 40) is used, the first application is usually made about mid-December, and the second in mid-February. These sprays, in addition to controlling red scale, will also effectively control white wax scale, purple scale and brown scale, and also the citrus rust mite.

A method that is very effective in controlling persistent infestations of red scale on heavily infested trees in orchards, and home gardens, is the application of two half-strength oil sprays (1 in 80; 8 fluid oz. to 4 gallons), with a short interval preferably only one or two days, between them.

Treatment for the control of red scale is compulsory under the provisions of the Plant Diseases Act.

The Tomato Mite (*Vasates destructor*).

THE tomato mite is one of the most serious pests of tomatoes during the summer and early autumn, and treatment for its prevention or control is necessary in all parts of the State.

The first signs of infestation are a silvering of the foliage, and drooping and curling of the lower leaves. The stems and leaf-stalks have a smooth appearance, and later both stems and leaves become brown, and the skin of the fruit may become roughened and corky-looking.

The mites, which have elongate yellowish bodies, are extremely small and can only be seen with the aid of a lens. They feed on the surface tissues of the stems, the leaves and fruit, and cause shedding of the blossoms and stunting of the fruit. In addition, they reduce the vigour of the plants, and the leaves, eventually, may wither and die.

Control.

Tomato mites may be controlled with sulphur dusts or sulphur sprays or with a DDT emulsion spray.

The DDT spray is used at a concentration of 0.05 per cent. DDT, as is used for the control of the tomato caterpillar (2 fluid oz. of 20 per cent. DDT emulsion to 5 gallons of water), and is effective provided the main stem and undersurfaces of the leaves are thoroughly sprayed, but most commercial growers prefer to spray or dust with sulphur to control this mite.

Early crops should be treated with sulphur when the first fruit commences to ripen, and again about a month later.

Summer crops should be treated in the seed-bed, again about four weeks after transplanting, and subsequently at three to four-weekly intervals.

Autumn crops planted out in January and February should be treated in the seed-bed and again after transplanting, about a week before routine Bordeaux applications commence. Treatment of mid-season and later crops for mite control should be a routine practice.

The sulphur dust consists of a mixture of equal parts of fine sulphur and hydrated lime.

The lime-sulphur spray is used at a dilution of 1 in 100 (1 pint of concentrate to 12½ gallons of water; 1 fluid oz. to 2½ quarts).

The spray is applied to the stems and leaves, particular attention being given to the undersurfaces of the leaves. The dust

Tomato Plant Infested with Tomato Mite showing Drooping and Withering of Leaves.

is applied in a general manner to the whole plant, and is to be preferred to the spray, both on account of its efficiency in controlling the mites and the ease with which it may be applied. Sulphur dusts, however, may burn tender seedlings if applied in very hot weather, and also may cause fruit scald on plants which are heavily infested with mites, but where routine treatments have been adopted and the infestation is not severe, fruit scald will not occur.

Where spraying with lime-sulphur follows treatment with Bordeaux mixture or other copper fungicide, some injury to the plants may result, but dusting with sulphur will not effect plants which have been treated with these fungicides. Lime-sulphur should not be mixed with Bordeaux mixture.

Where tomatoes are receiving regular treatment with Bordeaux, either wettable sulphur or colloidal sulphur may be added to the Bordeaux spray.

Wettable sulphur is used at the rate of 3 lb. to 40 gallons of spray mixture (3 oz. to 2½ gallons). This sulphur requires frequent agitation to prevent it from settling on the bottom of the spray container.

Colloidal sulphur and dispersible sulphur are used at the rate of 1 lb. to 40 gallons of spray mixture (1 oz. to 2½ gallons).

Colloidal sulphur, dispersible sulphur and wettable sulphur may be mixed with Bordeaux mixture.

General Purpose Spray.

The formula for a spray which is in general use in coastal tomato-growing districts for the control of pests and diseases is as follows:—

DDT emulsion (20 per cent.)	16 fluid oz.
Colloidal sulphur	1 lb.
Bordeaux mixture (1:1:40 or 1:1:20)	40 gallons.

For small quantities: DDT emulsion (20 per cent.) 1 fluid oz., colloidal sulphur 1 oz., Bordeaux mixture 2½ gallons.

In the above formula, wettable sulphur 3 lb., or dispersible sulphur 1 lb. to the 40 gallons of mixture, may be used instead of the colloidal sulphur. In areas where blights are not difficult to control, copper oxychloride (1-2 lb. to 40 gallons) often replaces Bordeaux mixture.

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APIARY NOTES

EFFECT OF RAINFALL ON EUCALYPT HONEY FLOWS.

D. L. MORISON, B.V.Sc., Apiary Branch.

LAST season and this present one have differed greatly in the amount of rainfall received. The summer rainfall of 1947-48 was unusually heavy; so heavy, in fact, that some primary industries were greatly hampered by it. The effect on some New South Wales apiaries was temporarily disastrous—for many bees died of dysentery due to the excessive water content of the nectar they gathered and their inability to ripen same owing to excessive atmospheric humidity. Moreover, the continued rainy weather prevented the bees working washed out bloom—even rotted the bloom—and caused much of the timber to run to new growth.

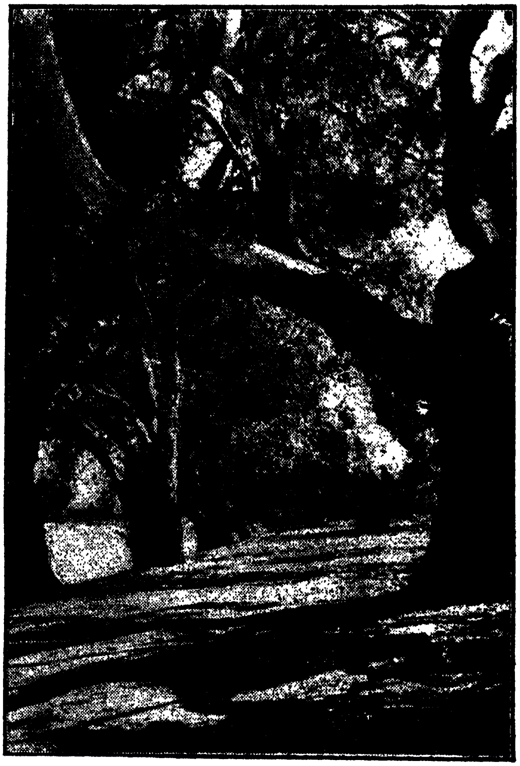
However, the advantages which have accrued to the current honey season in New South Wales, consequent on the last year's heavy rain, have far outweighed any temporary disadvantages that may have been suffered at that time.

In a previous article on "The Prediction of Honey Flows" it was contended that in order that a generally good season should result from the eucalypts, prolonged heavy rain must occur during the growing and budding season—which is the season prior to blooming, since the average eucalypt holds its buds nearly twelve months. Also, that warm, fine weather should prevail during the blooming season to enable the bees to gather and thoroughly ripen the nectar.

This contention is supported by the results from the past and the present seasons, for New South Wales is now experiencing what, on present indications, appears likely to prove the best season for honey production to date. This season's heavy production commenced with the blooming of the Red Stringybark in the autumn of 1948, and such species as Mugga Ironbark, White Box and Yellow Box have followed in continuous overlapping succession. Moreover, the "run" has not yet

ended, for the prospects on species still to come, such as the Coastal Bloodwood (*Eucalyptus corymbosa*) are excellent.

This sequence could be described by stating that a good honey year is usually experienced in a dry season following a wet season, or that a good season for honey usually follows a good season for grass.



Useful Honey Trees—The River Red Gum (*Eucalyptus rostrata*)—on the Darling River at Menindie.

[*Photo by R. D. Meaker.*

Of course, cases can be quoted in which this sequence of heavy production in the season following a year of heavy rain did not apply; for instance, the yielding of the Brown Box in Victoria, a few years ago, when the two or three years prior to blooming had been among the worst drought years known. However, these cases are exceptional.

Influence of Relative Humidity on Nectar.

The present season and its predecessor have provided material for more detailed observation on the effects of atmospheric humidity on honey flows.

If continued heavy rain is received and there is the usual accompanying high humidity, the bloom may be washed out or rotted, but even in fine weather when the relative humidity of the air is very high, it has been observed that though the secretion of nectar may be profuse, it is not attractive to the bees, apparently because of too low a percentage of sugar.

On the other hand, at Coolah, during the spring of this season when very dry conditions prevailed it was observed, that, though the Yellow Box was secreting a very sweet nectar in considerable amount, the bees were working other bloom in preference to it. Apparently, the other bloom was more attractive to the bees, yet when a few storms were received and the humidity increased, the bees commenced to work the Yellow Box very heavily. It would appear that, in very dry hot weather the bees may be prejudiced against a nectar which has a very low water content. Perhaps this is related to the water requirements of the bees for cooling purposes, etc., since moisture may be scarce.

At Lindfield it was observed that the Brush Box bloom was dry when this species first bloomed in November. However, at the first thunderstorm the bloom commenced to yield and the bees worked it very heavily.

From these observations it is evident that the relative humidity of the air has a very important bearing on honey flows as well as other conditions such as temperature. Each species appears to react differently to varying degrees of humidity; in other words there appears to be an optimum humidity for each individual species. Temperature should always be borne in mind when considering humidity, since it not only directly affects the bees and the bloom, but any rise in the temperature of the air increases its water vaporising power.

During an inspection of the dry western districts in the spring of this season, it was noted that the honey being extracted was of a very dense character; yet in December, 1947 (the time of heavy rainfall) one sample of Yellow Box honey examined was so thin that it would shake like water in the tin. This indicates that the excellent density of much of the honey harvested in inland districts of New South Wales is due more to

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S. R. NICHOLAS,
Secretary for Railways.

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seasonal conditions than to the type of flora itself.

In a previous article it was stated that the spacing of the trees in a forest influenced honey flows and that timber should be reasonably well spaced in order that individual trees should be well-developed specimens. While this applies in average seasons, the supply of soil moisture has been adequate for all in the present exceptional season and the most stunted weakling trees have budded, bloomed and yielded well along with the others.

It has also been observed that relative humidity has an effect on pollen supply—that should pollen become too dry the bees may have difficulty in gathering it.

What of Next Season?

The heavy general blooming of the present season gives rise to doubts in connection with prospects for next season. While there is no doubt that some bloom will be available, it is probable that, in general, species such as Yellow Box will be "spent" for a season or two.

When Opening Bee Hives.

THE following is a widely-practised routine for opening hives:—

1. Smoke the entrance of the hive, holding the nozzle of the smoker at the entrance, otherwise the cloud of smoke will be deflected by the guard bees.

2. Lift the lid slightly and smoke; the hive tool may be necessary to raise the lid if it is stuck down.

3. Place the lid down against the front of the hive; this gives a larger entrance platform whilst handling the colony.

4. The hive can now be dismantled according to the intended manipulation. When removing combs from a hive body it is recommended that the second comb from the outside, or the thinnest, be removed. Avoid taking the centre comb in the brood nest first as there is a danger of damaging the queen.

5. When removing bodies, place them in front of the hive; the first resting on the lid to prevent crushing bees on the bottom bars of the frames. Hive bodies should be stacked upon each other, but care must be taken to ensure that bees are not crushed where burr-comb is present between the sets of combs.

6. When reconstructing the hive, bodies should be placed slightly obliquely across the hive and twisted into position; this will push the bees out of the way without crushing them. By placing your hands on diagonally-opposite corners the body can be made to fit squarely on the hive.

Tomato Propagation by Cuttings.

GOSFORD growers have successfully propagated tomatoes on light soils by cuttings.

Several advantages have been claimed for this method of propagation, chief of which are that it does away with the necessity for raising seedlings, it enables the grower to ensure that his crop is the progeny of disease-free, vigorous plants, and it has been said that planting cuttings is easier than dibbling in seedlings. It has been claimed also that plants grown from cuttings give results at least equal to transplanted seedlings.

Complete branches of the plant, or the laterals which are normally pruned out, have been found to strike, provided they were young and vigorous. Laterals are said to be the most satisfactory type of growth for cuttings, old hardened growth not giving good results. Where laterals are used for this method of propagation they should be allowed to grow longer than they do when a crop is pruned regularly. It is a good idea when collecting the cuttings to remove any excess leaf growth to reduce transpiration in the young stages.

The soil must be warm before cuttings can be struck.

A LIMITED test with TIFA equipment using Gammexane was carried out at Glenfield Veterinary Research Station recently in order to ascertain the possible value of this form of treatment in the control of external parasites of stock.

Lice present on sheep and calves were all destroyed by exposure to the insecticidal fog. A temporary irritation was caused to the mucous membranes of the eye and nose of stock, but there were no permanent ill-effects.—DIVISION OF ANIMAL INDUSTRY.

Time of Sowing Cabbage Experiments.

THE results of tests to determine the adaptability of cabbage varieties for different times of sowing, carried out at Hawkesbury Agricultural College last season, will be of interest to growers with conditions similar to those at Richmond. They show the importance of planting cabbage at the correct time to prevent bolting to seed.

Seed of each variety was sown at monthly intervals from January to June. Varieties included were Succession, Drumhead, Enkhuizen Glory, Copenhagen Market and Burrawang.

For January and February sowing Copenhagen Market, Succession and Drumhead proved the most successful. Copenhagen Market was the only March-sown variety to give really good results, all other varieties showing a proportion of bolting, the worst being Burrawang. In the April-sown plots Succession gave best results; Burrawang and Drumhead showed a fairly large proportion of bolted plants.

The May-sown plots gave bolting only in the case of 5 per cent. of Burrawang, while the best heading varieties were Copenhagen Market, Succession and Drumhead. None of the varieties sown in June bolted; Succession and Copenhagen Market gave best results.

The January and February sowings produced heads of good quality and size. The size of heads decreased in March and April sowings, but increased again in the May and June sowings.—DIVISION OF PLANT INDUSTRY.

Harvesting of Citrus Fruit.

Points in Picking and Packing.

CITRUS fruits may not show injury from bruises for some time after picking, but the oil cells of the skin are very easily damaged, and it is through such injuries to the skin that decay organisms, such as those causing blue mould, make their entrance. Great care is therefore necessary when picking and packing for market, points out a departmental pamphlet.

Gloves should be worn or the finger nails kept extremely short, and the fruit should be picked or clipped with the button adhering, but with no length of stalk remaining that will come into contact with and puncture other fruit.

The fruit should be placed right into the picking receptacle, and not dropped in from the top, and the same care should be exercised in all subsequent handling between picking and packing.

Though paper lining, by checking the circulation of air in the case, may tend to produce conditions favourable for development of blue mould, the rough timber of unlined cases injures the skin and allows infection by disease, so that lining-paper is an advantage at times when packing citrus fruit. The best quality citrus fruit should be wrapped in sulphite tissue, and case lining paper dispensed with.

The cases should be well packed, and filled to a height of from 1½ to 2 inches above the top of the case, which will ensure a good bulge. Light softwood cases may have a greater bulge than heavier or hardwood cases.—DIVISION OF HORTICULTURE.

Improved Banana Packing Methods Necessary.

DURING the war, circumstances prevented banana growers giving proper attention to the handling, sizing and packing of their fruit—with the result that lax methods became commonplace. Despite such lapses in preparation and get-up for market, for years much of this fruit brought record prices on an under-supplied market. Even poor fruit which, pre-war, would not have paid for marketing, brought remunerative prices.

It has been obvious for some time past that such slack methods could not last. Already the peak price period has passed; production of bananas is again on the up-grade and will increase still further.

In consequence market requirements are being over-supplied and will continue to be over-supplied in future. This means strong competition between growers, since buyers discriminate when supplies are heavy. Growers, therefore, will find it necessary to adopt marketing methods which can stand up to strong competition.

This can be achieved only by honest grading and conscientious packing, and good-quality fruit so handled will bring top market prices regardless of competition. If a grower establishes a sound reputation in the markets his fruit is sold without inspection, on case markings alone. Loose practices in packing-shed operations (evidenced by the many growers being prosecuted for over-grading) must be replaced by better methods if growers wish to survive in the keen competition —DIVISION OF HORTICULTURE.

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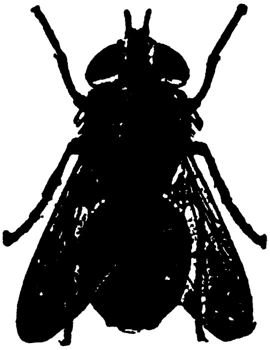

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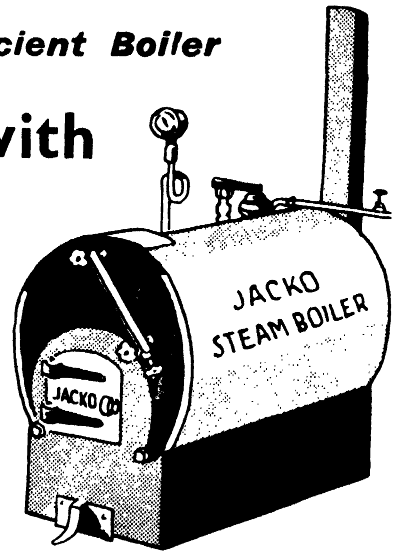

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Poultry Notes.

E. HADLINGTON, Principal Livestock Officer (Poultry).

THE PROSPECTS FOR 1949.

THE recent increase in the cost of poultry foodstuffs has caused consternation in the industry, but there is no reason for panic selling of hens. However, the conditions necessitate a rigid culling of all flocks which are not producing up to normal expectations. This applies mainly to second-year birds, but any inferior first-year hens should also be culled.

The cost of feeding has increased substantially and it is estimated that for the twelve months ending June 30th, 1949, the rate per hen will be 13s. 9d., provided that no further increases occur. This is the highest cost since records were first kept (1903-4), the previous highest figure being 12s. 8d. per hen in 1920-21.

The average net price of eggs in that year is shown at 2s. 2d. per dozen, leaving a return over cost of feed of 13s. 4d. per hen. This may be slightly in excess of the actual return, as the average price of eggs was not then computed on the monthly incidence of production, as in later years. However, the difference is not likely to be more than 2d. per dozen, which would reduce the return over cost of feed to 11s. 4d.—about 2s. per hen higher than anticipated for 1949, as will be seen from the figures quoted below.

Allowing for a probable payment of 1d. per dozen from the Pool Finance Fund on all eggs marketed from August to December, 1948 this year, and for egg prices being maintained at approximately the same level as for late summer and autumn, 1948, the average net price, to the producer, for the year ending 30th June, 1949, should be approximately 1s. 11¼d. per dozen, or 23s. 3d. per hen. This would show a return of 9s. 6d. per hen over cost of feed, which is about the same as for the year ending 30th June, 1948.

It will be remembered that the figures published in these "Notes" in July last, showed that after deducting other costs the farmer only received an amount of £225 net for his labour from a flock of 1,000 layers. Thus, with the increased cost of living it is anticipated the farmer will be somewhat worse off than last year.

In view of the position, no producer can afford to carry any hens which are not laying up to seasonal expectations. Normal monthly laying figures are given below:—

Month.	Eggs Per Hen.
January	13
February	11
March	7
April	6
May	4
June	6
July	10
August	16
September	19
October	19
November	17
December	16

These figures apply to flocks of first and second-year birds and the best course is to check production from each pen over a week or so, to see whether these levels are being obtained. If not, culling should be proceeded with. The extent of the culling will depend upon the condition of the birds generally.

In the case of pullets, no definite figures for production can be laid down, as they do not lay consistently until later in the year and much depends upon the time they were hatched and the conditions under which they were reared, as to whether they will lay satisfactorily during the late summer and autumn.

Pullets hatched after the end of September, unless reared under specially good conditions, cannot be expected to come into production before about April or May according to breed.

Average Egg Weights in the 1948-49 Egg-laying Competition.

PARTICULARS of the average egg weights in the current Egg-laying Competition at Hawkesbury Agricultural College are given hereunder.

It will be noted that there is a considerable increase in the number of disqualifications for failure to comply with egg-weight requirements, compared with recent years. However, this does not indicate that there is any deterioration in the weight of eggs, as the basis for computing the average weights was altered for this year.

Previously the weighing of all eggs was carried out during August, and any bird not laying twelve eggs during that month was allowed until the end of September, to qualify. In the current competition, the average weight was determined by weighing the eggs laid during the first seven days of the months of June, July, August and September, and any hen not laying twelve eggs during that period was given till the end of September, to qualify.

First Hen to Lay 200 Eggs in the Current Egg-laying Competition at Hawkesbury Agricultural College.

Owned by Mr. H. T. Chidzey, this hen laid the 200th egg on 12th November, 1948 (226th day) and won for her owner the *Poultry Newspaper* trophy valued at £2 2s.

The following is a summary of the disqualifications this year compared with those of last year. It should be noted that the number of hens laying underweight eggs last year was considerably lower than in previous years:—

	INDIVIDUALS. No.	INDIVIDUALS. Per cent.	GROUPS. No.	GROUPS. Per cent.
1948-49.				
Light Breeds	30	9	13	23.2
Heavy Breeds	20	9.8	11	32.3
1947-48.				
Light Breeds	17	5.6	6	12
Heavy Breeds	10	4.2	4	10

In 1948-49 twelve individual light breed hens and twelve heavy breed hens failed to lay the required number of eggs during the weighing period, and this increased the percentage of disqualifications as compared with last year.

MANAGEMENT, NUTRITION AND SANITATION IN FOWLS AND TURKEYS.*

G. W. SMITH, Livestock Officer (Poultry).

WITH the purchase by farmers of many thousands of day-old and started chickens from the Metropolitan areas of both Sydney and Melbourne, Southern District Inspectors of Stock are finding a greatly increased demand for their services in regard to diseases amongst poultry.

With the poultry population becoming more concentrated in country districts, disease has become a serious cause of loss to many farmers. Over-ambitious schemes in poultry raising often lead to failure through lack of knowledge, equipment and proper sanitary conditions with inevitable loss of a lucrative addition to a diversified farming programme.

Troubles that at one time were found in few flocks now often appear in epidemic form, the position being further complicated by the fact that, with improved methods of breeding, selection, feeding and management, hens are expected to lay during the greater part of the year instead of just the spring and summer months. This means that high production flocks have little reserves of vitality with which to fight an infection when it appears. It will be seen that it is of paramount importance that some consideration should be given to prevention of disease where large numbers of poultry are run under semi-intensive or intensive conditions.

Management.

Housing plays a major part in management, and is a matter of great importance in Riverina with its extremes of hot and cold conditions, calling for a better type of house than that required under milder coastal climates. Diseases classed as "roup" are the cause of much economic loss, and may invariably be traced to faulty housing and management.

On many farms visited the housing of poultry leaves much to be desired. Often little or no shelter is provided from the elements; the stock are left to huddle beneath the barest tree, and most of the nourishment provided is used to keep the birds alive and warm, without any hope of high egg production.

Ventilation is of the utmost importance in the construction of a poultry house. An open-fronted shed does not necessarily mean that it is well ventilated; provision must be made for an opening from 4 to 6 inches deep directly below the roof at the back of the house, this opening to run the full length of the building.

The need for ventilation to remove moisture is indicated by the fact that several gallons of water are given off by 100 birds daily through respiration and excretion.

Nutrition.

The first use of any food supplied to a hen is to support life; not until this requirement is fully met will any of the food consumed be used for growth, egg production or fattening. Two-thirds of the annual intake of food of a healthy bird is used for maintenance alone. Under mixed farm conditions a hen must travel about in search of food. To keep up the normal body temperature, which is 106 deg. Fahr., the hen will use up large quantities of heat-producing food. As a result of this rapid rate of metabolism, the fowl reaches maturity at the age of six to eight months.

With the introduction of chicken and turkey starter mashes, now readily available from produce merchants in most country centres, many nutritional troubles in

*Address given at a recent conference of Southern District Stock Inspectors.

the early stages of growth have been overcome. However, care should be taken to feed turkey poults an adequate protein supplement to counteract the tendency to Perosis (Slipped Tendon). This condition is prevalent under natural range rearing in the Southern and Western Districts during drought periods when green pick and insect life are at a premium.

The addition of 10 per cent. meat or liver meal to wet or dry mashes, together with 4 per cent. linseed meal will do much to prevent this condition, and also hasten growth in poults from day-old onwards.

Sanitation.

Sanitation is the foundation of successful poultry raising from start to finish, the following eight point plan is one that may be followed with confidence and should lead to reduced mortality.

1. *Clean Incubators and Eggs.*—Scrape, scrub, and disinfect incubators, use only clean eggs.

2. *Clean Chicks.*—Start with disease-free chicks or eggs—they should come from flocks which are known to be free from Pullorum and Avian T.B.

3. *Clean Brooder Houses.*—Scrape clean, scrub with lye water or other disinfectant before and after each brooding season. Scrape and clean inside brooder runs every day and cover with dry sand.

4. *Clean Watering.*—Faulty drinking conditions lead to wet patches in rearing pens; these soon become ideal breeding grounds for harmful bacteria.

5. *Clean Ground.*—Use rearing ground for young stock only and spell for three months each year.

6. *Clean Feed in Hoppers.*—Feed only in hoppers that cannot waste or allow feed to become contaminated.

7. *Clean Management.*—Avoid travelling from adult quarters to chicken rearing yards, without cleaning boots and utensils.

8. *Clean Laying Houses.*—Scrape clean. Scrub with disinfectant before placing pullets in laying quarters. Clean under perches at regular weekly intervals and replace straw frequently in scratching portion of the houses.

Advantages and Disadvantages of Pelleted Vegetable Seed.

INVESTIGATIONS into the effectiveness of pelleted onion, cabbage, lettuce and tomato seed sent out from U.S.A. have been carried out by the Department of Agriculture at Hawkesbury Agricultural College.

The pelleting of seed is a process whereby individual seeds of various types are coated with inert materials so as to increase size, and form spherical uniform pellets that can be readily space-planted. The principal advantage claimed for this method is that it makes precision planting possible, thereby eliminating labour for hand thinning.

Although the sowing mechanism of the machine used in the trials at Hawkesbury Agricultural College was not altogether suitable, the results did indicate that the use of pelleted seed gave a more even spacing of small-seeded vegetables, such as lettuce and carrots.

A disadvantage noted, however, was a delay in germination of the treated seed—and in the case of crucifers a consequent delay in development. Lettuce seed in particular gave disappointing results as regards germination, being less than 20 per cent. and very patchy, whereas untreated seed germinated well.—A. C. ORMAN, Special Agronomist.

Mortality in Sheep Caused by Careless Use of Cyanide.

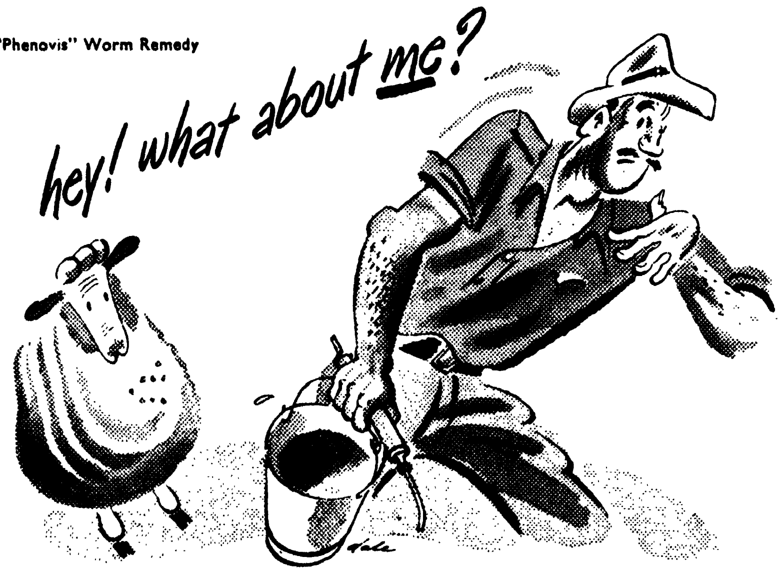
MORTALITY in sheep caused by careless use of a cyanide preparation sold for rabbit extermination, was recently investigated.

The losses included nine sheep that had died from ingestion of rabbit poison spilled while being transferred to smaller containers or by having been left in uncovered burrows, within easy reach of sheep.

The preparation consisted almost entirely of sodium cyanide in lump form. Analyses by the Chemist's Branch of the Department indicated that at the end of six days, 40 per cent. of the available hydrogen cyanide had not been liberated.

Those who have been accustomed to handling cyanide compounds in dust form (from which most of the hydrogen cyanide is liberated within a relatively short period after exposure to air, leaving a harmless residue) had failed to appreciate that sodium cyanide in lump form may remain poisonous for a considerable period.—DIVISION OF ANIMAL INDUSTRY.

"Phenovis" Worm Remedy



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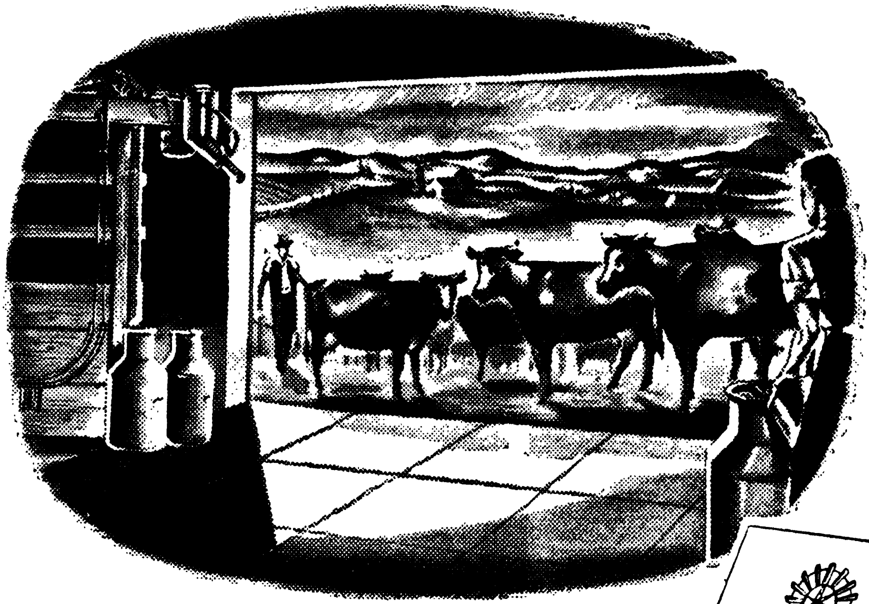

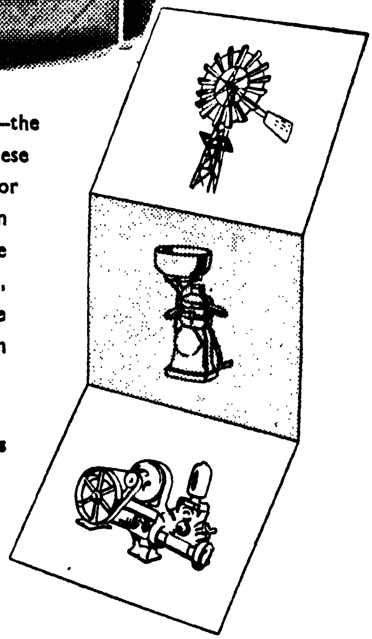

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Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	89	25/8/48
Berry Training Farm, Berry (A.I.S.) ...	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ...	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	297	9/6/49
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	74	2/2/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	90	12/11/48
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	27/10/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell ...	34	5/4/49
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/4/49
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood ...	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H., Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale ...	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood ...	31	13/8/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
McMillan, N., Duval Road, Armidale ...	32	8/10/49
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Police Boys Club, Kurrajong...	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
Rowlands, F. C., "Werribee," Waugoola ...	35	23/8/49
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	7	8/10/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49
Tanner, F. S. Dural Rd., Armidale	42	8/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49
Ursuline Convent, Armidale	5	7/10/48
Von Frankenberg, F. E., "Spring Hills," Camden	68	12/12/48
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5/7/49
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, F. J., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/49
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Mortality in Sheep following Drenching for Worm Infestation.

THE Department has received many reports on sheep which have died from injury caused to the mouth during the process of drenching with automatic drenching guns.

A word of warning is issued by Mr. W. L. Hindmarsh, Chief of the Division of Animal Industry, who points out that it is false economy to endeavour to break records when drenching sheep.

These automatic drenching guns must be used gently to avoid injury to the mucous membrane lining of a sheep's mouth—particularly when the bluestone-black leaf 40 drench is being used. Severe ulceration of the mouth and mortality can be caused by entry of organisms through wounds made by drenching guns carelessly used.

Although the drenching mixture should be directed towards the side of a sheep's mouth rather than straight down the throat, the nozzle of the gun must not be forced against the side of the mouth.

Every effort should be made to keep the end of the nozzle smooth, and rough projections caused by constant contact with teeth should be filed down. The ideal method of preventing injury is to place a small piece of rubber tubing over the end of the nozzle, allowing it to project for about half an inch, so ensuring that the hard metal parts of the gun do not touch the mucous membrane of the mouth.

Lameness in Cattle.

SEVERAL reports dealing with marked lameness and loss of condition in cattle have been received recently by the Department from the north and north-west of the State.

The symptoms described are very similar to those seen in Ephemeral Fever (Three-day Sickness) which was very prevalent in this State some years ago. However, although suitable blood specimens have been forwarded to the Veterinary Research Station at Glenfield, it has not been possible so far to transmit the infection. The cause, therefore, still remains obscure, and further research into the trouble is being carried out.—DIVISION OF ANIMAL INDUSTRY.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Evans, C. A. & Sons "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury Agricultural College, Richmond (Jerseys)...	107
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ..	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
Walker, Jas. R., "Strathdoon," Wolseley Park (Red Polls)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm (Jerseys)	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callen Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	58
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Salway, A. E., Cobargo (Jerseys)	39
Rydalmere Mental Hospital, Rydalmere	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

Milking Methods Influence Cream Quality.

UNDER present-day conditions, probably no single item is more responsible for production of second-grade or "bare choicest" quality cream than careless milking. By this is meant such practices as failing to wash the cow's udder before milking; milking more than one cow without the milker washing his hands; as well as handling dirty milking stools, bail door release rods coated with stale milky matter—often to a measurable thickness—and breeching and leg ropes that are often urine- and manure-saturated, and then milking without washing the hands.

Such habits result in countless thousands of bacteria gaining entrance to the milk, and so the seed is sown for the development in milk and cream of overripe, unclean, fermented, and cheesy flavours—to mention a few.

Many dairymen wash their hands after milking one, two or more cows. Most frequently they use a little water in the bottom of the wash-up tub, or in a basin or tin. In a very little while this water is discoloured and is little more than a bacteria-laden "soup." While visible dirt is removed, the hands are still coated with countless numbers of invisible microbes.

The use of running water is the best method of washing the hands. A convenient means of supplying water for this purpose is an 8- or 10-gallon drum fitted with a small tap, and placed in a convenient position in the bails.—DIVISION OF DAIRYING.

THE most important legume in coastal pastures is White clover, one of the few useful plants which will persist in association with a rampant grower such as paspalum. However, White clover cannot thrive unless the bulky growth of paspalum is controlled, and this can only be satisfactorily carried out where the pasture paddocks are subdivided into effectively-sized units. The stocking figure, generally, for this calculation in coastal districts, on good quality paspalum-White clover pastures, is twelve cows per acre.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Holland, A. L., Argonne, Tubbul.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Ricketts, Mrs. H. I., "Mangus," Young.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Watch the Feeding of Calves after Weaning.

CALVES are often retarded in growth and development after they have been weaned off a milk diet, points out a departmental leaflet. The setback, however, is not likely when calves are well grown and a good age before being weaned.

For that reason, in cream and cheese producing districts, it is wise, if at all possible, to keep the calves on separated milk or whey (even though the ration is only small) until eight months old, and keep meal and hay available if the pastures are not up to standard.

After calves are weaned, provide sufficient feed to keep them growing and in strong condition.

Sometimes the opinion is advanced that young dairy stock will benefit by being kept on the lean side. It is very doubtful whether this is sound in principle.

The robust, strong-constitutioned animal, all other things being equal, can be expected to produce better and to turn out a more efficient animal than one that has been kept on the "fine" side. However, calves should not be fed so that they become overfat.

A SINGLE treatment of 1.8 per cent. DDT has been shown in a departmental experiment at Wagga Experiment Farm to clean up fowl tick infested houses. Interiors of houses were lightly sprayed, special care being taken to ensure that the usual hiding spots for the ticks were well treated.

DDT has also been found effective in the control of poultry red mite. As a result of an experiment with DDT at Wagga, and of inspections of privately DDT-treated poultry houses in the metropolitan area, it is clear that this chemical will substantially reduce the mite population.

At Wagga Farm mildly mite-infested houses remained practically free of red mite for eight weeks after treatment.

THE AGRICULTURAL GAZETTE FOR FEBRUARY, 1949

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The AGRICULTURAL GAZETTE OF NEW SOUTH WALES

Editorial—

RABBIT CONTROL.

The Job is Not Too Big.

AGAIN the country is menaced by the rabbit pest. This present "wave" cannot be interpreted as an indication that the rabbit is beyond "mastery", or that primary producers have become apathetic, or that advocated methods of eradication are out-moded.

It was recently stated by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) that methods of destruction and eradication recommended and demonstrated by his Department were on a par with those practised in any other rabbit-ridden country in the world. And the Minister did not believe that producers had become apathetic. The many adversities which Australian producers had faced and overcome stamped them as too big in courage and resourcefulness to be beaten by the rabbit.

A favourable season in most districts has favoured the present multiplication of the pest. To that has to be added another, and perhaps greater, reason for the present plague. Of necessity, rabbit destruction was neglected during war years, when men and materials were not available to combat the pest. Nor has there been sufficient time since to take-up on the back lag.

Shortage of netting for rabbit-proof fences, lack of labour for digging or ploughing out, the shortage of fumigants are the biggest obstacles to waging an all-out attack on the rabbit.

The authorities are alive to these difficulties, and are striving to remove them. Steps have been taken to step-up local production of wire netting, the effects of which should be evident within a few months from now.

Netting and fumigants are being imported, though necessarily in limited quantities because of the dollar position. The possibility of finding more dollars for increased imports of these much-needed materials is being explored from time to time.

There is no magic wand to banish the rabbit. Well directed effort in the application of such proven methods of eradication as erection of rabbit-proof fencing, digging and ploughing out, fumigating, poisoning and trapping is still the answer to the rabbit threat.

Add to that another important requirement—full co-operation between primary producers and the local authorities whom

they elect to administer rabbit destruction legislation—and you have all the ingredients for the only known remedy for the rabbit menace.

There has been no let up in the search for more effective controls. At present, however, most promise is offered by more expeditious and cheaper methods of carrying out present recommended methods of eradication. For example, the tractor with ripper attachment seems destined to replace much manual labour in digging out and ploughing out warrens and burrows.

The present flare-up in the rabbit plague will be regarded by reasonably-minded people as partly, if not largely, the result of an extraordinary set of conditions which will pass with the return to normal times.

What then? Will proven methods be whole-heartedly applied? Will Pastures Protection Boards and other responsible authorities then be accorded full co-operation by all landholders? In other words, will rabbit-menaced producers follow the examples set by thousands of their fellow-producers who have already proved that it is practicable to rid their properties of rabbits?

There would seem to be good grounds for believing that the farmer or grazier who refuses, in normal times, to put up a stiff fight against the rabbit, has sufficient land on which to farm (or graze stock) and also run rabbits; in other words, too much land. That factor could, in some instances, be at the root of the rabbit problem.

Diploma Courses in Horticulture.

FOR the benefit of students wishing to specialise in horticulture a specialised course has been added to the curriculum of the normal Hawkesbury Diploma in Agriculture course at the Hawkesbury Agricultural College.

Making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said, "This new course, which will commence in 1949, will provide a thorough knowledge of horticulture for students who intend to take up practical orcharding, or instructional work in this field as a profession. It will be open to students at the College who have completed the first two years of the normal Diploma in Agriculture course, and those selected will specialise in horticulture during the third year to qualify for the distinction of H.D.A. (Hort.). Provision has been made for sufficient training in food preservation to permit graduates to qualify for positions as field officers with canneries and other commercial firms associated with the horticultural industry."

During the third year the following subjects would be treated:

Advanced Horticulture, Principles of Food Technology (Part I), Agriculture (Part III), Agricultural Economics (Part II), Horticultural Botany, Advanced Entomology, Advanced Plant Pathology, Organic Chemistry, Public Relations.

Principles of Food Technology lectures would comprise such subjects as Introduction to the Preservation and Processing of Fruit and Vegetables, Unit Operations in Fruit and Vegetable Processing, Canning of Fruits, Laboratory Examination of Processed Foods.

During the course practical work would be carried out in the College orchard, vegetable garden and cannery. Experience in horticultural practices such as planting, contouring and irrigation, not provided for by the College facilities, concluded the Minister, would be obtained by visits to other departmental experiment farms and the Murrumbidgee Irrigation Area.

Wheat Sowings Not Under Control.

"THERE will be no control of areas which may be sown to wheat this year." Making this statement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), said that the Commonwealth National Security (Wheat Industry Stabilisation) Regulations providing for the registration of wheat farms and the issue of wheat licenses lapsed on 31st December last.

"Proposals recently adopted by the Governments of the Commonwealth and the various States and endorsed by a majority of growers for the stabilisation of the wheat industry do not require the registration of farms or the issue of wheat licenses," continued Mr. Graham.

"Licenses will not, therefore, be issued for the coming crop and growers will be in a position to make their own arrangements for the sowing of crops, irrespective of whether or not their farms were formerly registered under the National Security Regulations."

SOME RECENT DEVELOPMENTS IN HERD RECORDING.

Application to Modern Stock Breeding Methods.*

I. W. SCOTT, H.D.A., H.D.D., Special Dairy Officer (Herd Recording.)

To-day the great food need of the world—particularly Great Britain—is fats. While measures, such as better feeding of present stock, milking extra cows, milking cows for a longer period, etc., are means which could be used to assist meet this need quickly, better breeding methods are the long-term main basis of increased production.

Herd recording has a very valuable part to play in the implementing of modern ideas of increasing dairy production.

Firstly, I want to discuss the place of herd recording in the dairying industry. "Feed, weed and breed" has long been a slogan among dairymen, and it is in connection with weeding that herd recording or testing can play a vital part—by furnishing reliable data on which to cull and base breeding operations.

Herd recording or herd testing is simply the systematic recording of the individual production unit on the farm, by either the owner or the Government, as the basis on which the farmer can plan his herd improvement.

Just as it is necessary for a person to add up his debits and credits to determine his financial position, so is it necessary to add up each cow's debits and credits to assess her worth. In credits we look for long life, consistent production and regular breeding, with freedom from disease, while as debits we take into account such things as low inherent productivity, short life, long dry period, mastitis, mistaken identity, poor feeding and over-stocking.

* Extracts from an address delivered before the Clarence Division of the Agricultural Bureau of New South Wales—10th November, 1948.

History of Herd Recording in New South Wales.

Herd recording in this State has been practised in a desultory way since 1905 and, on the Far North Coast, from 1912 or thereabouts was controlled by the farmers themselves under a subsidy scheme. This scheme failed, and in 1924 the Department of Agriculture took over control, with the result that the number of cows under record increased from 11,000 in 1924-25 to 82,000 in 1929-30, when a decline set in, to 1,600

Good Quality Breeding Stock are the Foundation of the Future Herd.

in 1942-43. Since that date the numbers have been on the up-grade again, until 40,000 cows were under record last year.

Yields have fluctuated between 129.4 lb. butterfat per cow in 1926-27 to 182 lb. butterfat in 1933-34.

Comparing the 5-year average of recorded cows since 1924, some progress is indicated, as the averages for four such periods have been 141.3 lb., 158.4 lb., 163.1 lb., and 164.9 lb. fat, though for the first three years of the present period the average is 145 lb. No consistent increase can be shown, as is the case in New Zealand, where in the same period yields have increased from 224 lb. to 279 lb. per cow, with yields consistently above the starting point.

Briefly, the variations in yields in this State have been caused by such influences as the great vagaries in seasonal conditions, which have not in general been offset by fodder conservation and pasture improvement, while not every cow has been regularly recorded, and so on. Too much emphasis has also been placed on the catchwords of the past, such as "Use a bull from a high-producing cow and save heifers from the highest producers." How fallacious this can be, many dairy farmers no doubt know from experience. However, we have since learnt the advantages of the use of a proven sire, or the son of a proven sire—a sire proven by the production of his daughters, to be capable of transmitting high production.

A "New Deal" in Herd Recording.

In the past, too, farmers who recorded were not given sufficient advice and instruction in application of information obtained by recording, and many did not take great interest in the scheme. However, greater interest on the part of the farmer is now being fostered by use of individual production cards for cows recorded, by the preparation of herd summaries of the results of each herd, by the introduction of a free Calf Marking Scheme by which a farmer can be sure of the identity of each animal coming into the herd, by the provision of a Sire Survey Scheme whereby the farmer will have accurate data on which to judge the value of the sire and to aid in his selection of future sires.

Value of the Proven Sire.

Uncontrolled breeding is a gamble. American work has amply demonstrated that progress can be made without culling in the female line, provided the right sires are used; a proven sire is a good bet anywhere.

That breeding without records is a game of chance, may be illustrated by the following. It is common knowledge that all the hereditary material in an animal is passed on from generation to generation by factors or genes. There are a great number of these genes and on the way they are passed on and re-assembled, depends not only the animal's outward appearance, but the outward expression of its internal make-up expressed in terms of production.

Inheritance of Milk Production.

The inheritance of milk production is not quite as simple a matter as is, for example, the inheritance of horns, but using this simple example may explain some of the difficulties of breeding for high production. Horns are inherited by two simple factors, one for horns and one for the polled condition. These factors exist in pairs, and in the mating of two animals only half the factors of each parent go into the new life. Now, if we take the case of a pure polled animal mated with a horned animal, the polled animal contains one pair of genes for the polled condition and the horned animal one pair of genes for the horned condition. At mating there is passed on to the new life, one gene from each parent to form a pair, so that the new life has one gene for polledness and one gene for horns, but as the polled gene is dominant to horns, the offspring is polled but carrying a horned factor.

However, if two such animals of "mixed" inheritance are mated together we get a different result—25 per cent. pure polled, 25 per cent. pure for horns and 50 per cent. polled but carrying a factor for horns —just as you would get 25 per cent. heads, 25 per cent. tails and 50 per cent. heads and tails if you tossed pennies a sufficient number of times playing "two-up."

Substitute high production for polled and low production for horns, and you could expect 25 per cent. high producers, 25 per cent. low producers and 50 per cent. medium to high producers all carrying factors for low production. Thus if you mate a bull

from a high-producing cow carrying low-production factors to a high-producing cow also carrying low-production factors, you may get a high producer or a low producer.

This is why the sons of high producers often fail as herd sires. The safe method is to select a sire that has proved, through his daughters, that he is throwing uniformly high producers, and failing that, a son of a proven sire out of a high-producing cow.

However, as stated earlier, milk and fat production is not as simple a matter as inheritance of horns, as more factors are involved. Consistent recording of all herd units, particularly dams and daughters under the same conditions is necessary properly to evaluate the sire in use.

A Wastage Survey.

Farmers have an obligation to produce as much as cheaply as they can. The Department has an obligation to give those who are sufficiently interested, certain information and to show them how to use it. It is also a departmental obligation to endeavour to point out weaknesses in the industry so that the farmer and the State can take steps to remedy these weaknesses. To this end the Department is asking members of the Recording Scheme and others to supply particulars of sire wastage and herd wastage as a starting point and is hopeful of co-operation. There are at present, for instance, no authentic figures in this State of the wastage due to such causes as brucellosis, mastitis, tuberculosis, milk fever, bloat, old age, etc. By the analysis of figures obtained it is hoped that attention will be focussed on facts of economic importance.

Valuable New Zealand Surveys.

Many interesting facts have come to light through the assistance of the farmers both in and out of the Recording Movement in New Zealand, and I feel sure that the same result will be obtained here.

In New Zealand it was found that wastage due to mastitis amounted to 21.7 per cent. of total wastage, sterility and abortion to 16.3 per cent., focussing attention on the need for increased efforts to combat these diseases. A very limited survey here showed 16.1 per cent. due to mastitis and 24 per cent. due to sterility and abortion.

Further surveys showed that, of losses in calves, that due to scours and general unthriftiness was fourteen times greater than that due to blackleg, emphasising the need for more general advice to farmers on overcoming these troubles. Fertility surveys showed that 68 per cent. of cows hold to first service and a further 21 per cent. to the second service, while 7 per cent. remain empty at the end of the year. Approximately half the animals that did not conceive were culled and 80 per cent. of the remainder conceived during the next season.

Further surveys showed up the fact that, up to ten years of age, a sire's fertility did not materially decline as is popularly supposed. This is a factor of great importance where proven bulls are concerned; far too many good bulls are culled at five years of age in the mistaken belief that they are of no use after that.

We are aware, in a general way, of the importance of high test in butter areas, but New Zealand definitely showed that there is a strong correlation between butterfat test and total butterfat, with the general conclusion that in breeding for high levels of butterfat production it was necessary to combine better-than-average tests with improvement in milk production. While it is true that high levels of butterfat production can be obtained through a combination of high milk production and low-average test, the odds are against any strains of low-testing families breeding high butterfat producers as compared with families above the average in test. These remarks have particular reference to within each breed and not as to one breed against another.

The Relation of Recording to Artificial Insemination.

Artificial insemination is becoming increasingly of interest to New South Wales farmers. It has made great strides in England and in U.S.A. where some 2,000,000 cows are now enrolled in 886 co-operative associations in forty-two States, whereas ten years ago there was one association and 1,100 cows.

When comparing artificial insemination in England and in this country it must be remembered that in England a good bull may cost £300 and that two-thirds of the

dairy farms have fourteen cows or less. The cost of artificial insemination there is 25s. per head; this makes the method of great value to the small herds.

In this country, on present costs we can hardly expect artificial insemination to make such spectacular strides as in the old country, or the United States of America, but there is no doubt that there is a place for it, as a means of disseminating superior breeding lines to breeders of purebred stock, who in turn will be able to supply better bulls to the commercial dairyman.

The Department is deeply concerned with this possible development. There is a moral obligation for breeders who supply supposedly superior bulls, to record the production of their herds and ascertain the true value of the sires in use and of the female breeding stock.

Departmental Bulls for Private Breeders.

To assist in the search for superior breeding stock the Department is anxious to have records of the production of the daughters of as many sires as possible, and to this end is preparing to put out bulls from its own studs, on loan to certain approved farmers—to men who are prepared to record production continuously and to prove the sires placed with them. In this way it is hoped to prove a great number of sires, and if in the process outstanding animals are discovered, the production lines of these superior sires can then be disseminated as widely as possible, first to stud breeders and then to commercial dairymen, by means of artificial insemination.

Good Bulls are Scarce.

How scarce really good sires are can be seen from the last report published by the New Zealand Dairy Board, which gave the results of 1,204 sires for the season. Twenty-four per cent., or, one in four, were classed as improving production, while 22 per cent. were only capable of maintaining production, and 55 per cent. of bulls lowered production.

The higher the production of the dams to which the sires were mated the fewer bulls there were capable of improving production. Thus where the dams averaged—

400 lb. butterfat and over—
 5 per cent. bulls improved production, and 83 per cent. lowered it.

340-359 lb. butterfat—
 13 per cent. bulls improved production, and 62 per cent. lowered it.

300-319 lb. butterfat—
 25 per cent. bulls improved production, and 55 per cent. lowered it.

260-279 lb. butterfat—
 43 per cent. bulls improved production, and 28 per cent. lowered it.

Under 260 lb. butterfat—
 51 per cent. bulls improved production, and 18 per cent. lowered it.

Most New South Wales herds average less than 260 lb. fat. Taking the figures for 1946-47, the lowest and highest district averages for dairy districts were:—

Lowest district—2,507 lb. milk, 111.4 lb. fat.

Highest district—5,568 lb. milk, 212.3 lb. fat.

The New South Wales average for that season was 3,750 lb. milk, 160.0 lb. fat.

In the United States of America herd-recording figures showed that "year in and year out, approximately one-third of the sires proved lower production while one-third maintain production and another one-third definitely raise production." The same report states: "If only those bulls, the daughters of which produced more than the dams, were used, the national average would undoubtedly go up sharply. The national breed average is bound to stay where it is so long as approximately 66 2/3 per cent. of the bulls used either breed down or just maintain production, while only the others breed up."

Value of Dam-Daughter Comparisons.

In regard to dam-daughter comparisons it is contended by some that the bull whose daughters exceed breed average in their class is a bull worth using, regardless of the production of the dams. However, dam-daughter comparison is of greatest value to breeders who compare the records of individual dams and daughters.

While this comparison of daughter with her dam will be valuable to breeders, it is considered quite secondary to the testing of all the daughters of a sire—not leaving out one, even in the first year of production. In other words, the commercial dairyman who is recording should pay great attention to the straight-out average of the daughters of a bull, compared to the average

within his own herd. Of the many phases of selection, the proving of sires by recording consecutively borne daughters outweighs all others in value.

A Basis for Herd Improvement.

With modern knowledge of nutrition and genetics as a basis, it is evident that improvement in herd production can best be achieved by:

(1) Improvement in feeding methods. While this is being effected, by the development of sounder cropping systems, improved pastures and judicious supplementary feeding—

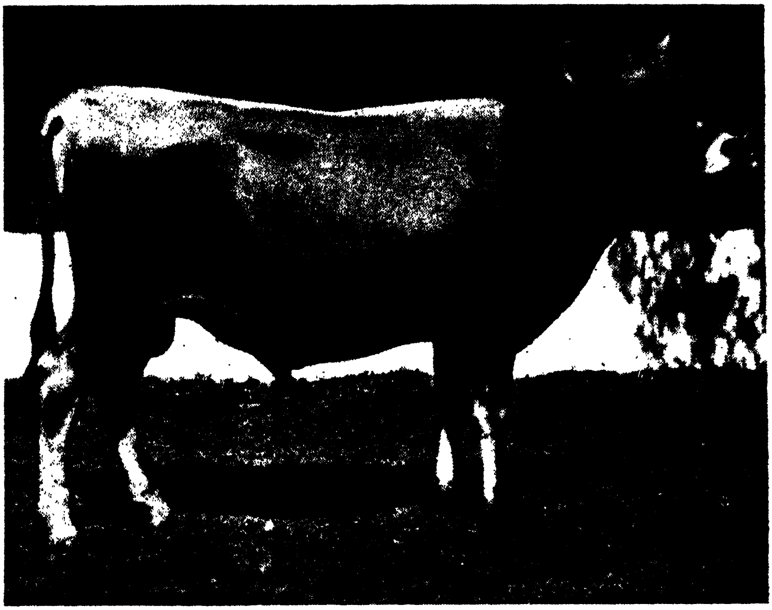
fix on a definite line and then not deviate from the breeding policy without very good reason.

In the selection, the pedigree should be carefully examined for evidence of production backing, as shown by—

(*a*) Records of the daughters of the sire being purchased, if available, as compared with their dam's production.

(*b*) Records of the daughters of the sire of the bull being purchased, and the records of their dams.

(*c*) Records of the daughters of the maternal grandsire.



A Future Herd Sire.
Can we predict his value without records?

(2) Ascertaining the individual production of all cows in the herd by submitting the herd to continuous recording.

(3) If the sire in use is nondescript, replacing him with a better-quality animal, proven if possible; if this cannot be done at present, selecting an animal with sound production backing.

A Purebred Sire is Essential.

A herd sire should be chosen only after mature consideration has been given to the suitability of that particular line of blood to the pastoral conditions of the particular farm and district. There are many lines of blood now well established, the productive and reproductive capacities of which have been proved. Commercial dairymen should

(*d*) The record of the sire's dam and of her daughters and/or sisters.

Copeland sets out that, in studying a bull's ancestry—

"(i) The records of the sire's daughters are considerably more valuable than is the record of the dam alone.

"(ii) The records of the daughters of the maternal grandsire are more closely related to the production of the grandsons' daughters than are the records of the daughters of the paternal grandsire.

"(iii) It would appear that if a cow has a production record herself, and if she has two or more tested daughters, and if in turn her sire has a number of tested daugh-

ters, the sum of this information gives a good index of her germinal composition. This combined information is necessary to accurately evaluate a cow's transmitting ability.

"(iv) The selection of a calf with the foregoing qualifications should reduce to a minimum the element of chance involved. A large majority of young bulls with such pedigrees should sire high-producing daughters, particularly if bred to cows possessing an average inheritance of production."

(4) Adopt the calf identification scheme which is free, and ask the Department to survey the sires used.

(5) After culling the herd of obvious misfits (diseased udders, etc.), base culling on production figures, concentrating on saving stock from the long-lived, consistently-producing families.

(6) Follow one proven bull with another proven bull or the son of a proven bull. Do not discard bulls until proved—too many good bulls go to the butcher for lack of a bull paddock or two.

(7) Keep proper records, and in this the Departmental officers can be of great assistance.

References.

Twenty-third annual report of the New Zealand Dairy Board, Wellington, New Zealand.

COPELAND, *Journal of Dairy Science,* Vol. XVII, No. 2.

Space Platforms—Possible Agricultural Significance.

THE Press has recently given much publicity to an announcement in the Annual Report by the United States Defence Secretary, Mr. James Forrestal, concerning a project which has been named the "Earth Satellite Vehicle Programme". The report states that experiments aimed at placing man-made satellites or space platforms beyond the active attraction of the earth's gravity are to be made early this year. "Eventually" says the report "it is hoped to build space stations in which men could live and work."

The American military authorities envisage the possibility of focussing the sun's rays to cause fires and to dry up lakes and rivers in enemy territory; however, it is obvious that if this becomes practicable, important peace-time developments of scientific and agricultural significance would ensue. One possibility that suggests itself is that artifically increased evaporation of ocean water where shoreward winds were blowing, might be used to increase the rainfall over arid and semi-arid areas, with a consequent extension of agricultural and pastoral areas, and an increase in available world food supply.

It is interesting to record that the Annual Report of the Workers' Educational Association of New South Wales for 1947 describes the presentation (2nd December, 1947) by the Association's Drama Group of a play, "Space, Time and Emotion" which dealt with the establishment of a space platform—called in the play, H.M.A.S. Imperturbable—in the years 1965-66.

The play was written as long ago as November, 1945, by an officer of this Department, Mr. A. N. Old of the Chemist's Branch. In it the problems associated with living in such a platform—the provision of air, water and food—were discussed and the potentialities of the platform as an observatory to record physical data and as a base for further scientific exploration were set out.

£130,000 to be Spent on Additions to Country Elevators.

"TENDERS have been accepted for the construction of additional storage bins at seven country elevators at a cost of approximately £130,000 and it is expected that the work will commence almost immediately."

Making this announcement the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that existing silos at Brushwood, Holbrook, Marinna and Tootool would be enlarged by the erection at each centre of two additional bins each of 50,000 bushels capacity, while storage space at Gilgandra, Narromine and Peak Hill would be increased by the erection at each centre of three additional bins, each of 50,000 bushels capacity.

In addition to the erection of the extra bins, the silos would be modernised by conversion to complete electrical operation, which would ensure the most up-to-date and efficient methods in the receival and handling of wheat at those centres.

Mr. Graham said that was the first phase of the Government's progressive silo extension programme recently announced by him, and it would be followed by additional works as soon as possible.

"Owing to the difficulties associated with the purchase of machinery for new silos, the first part of our programme is being restricted to the erection of additional bins at all the smaller silos where storage space has been found inadequate," concluded Mr. Graham. "When the position in regard to machinery improves, we will proceed to construct silos in centres where none exist at present."

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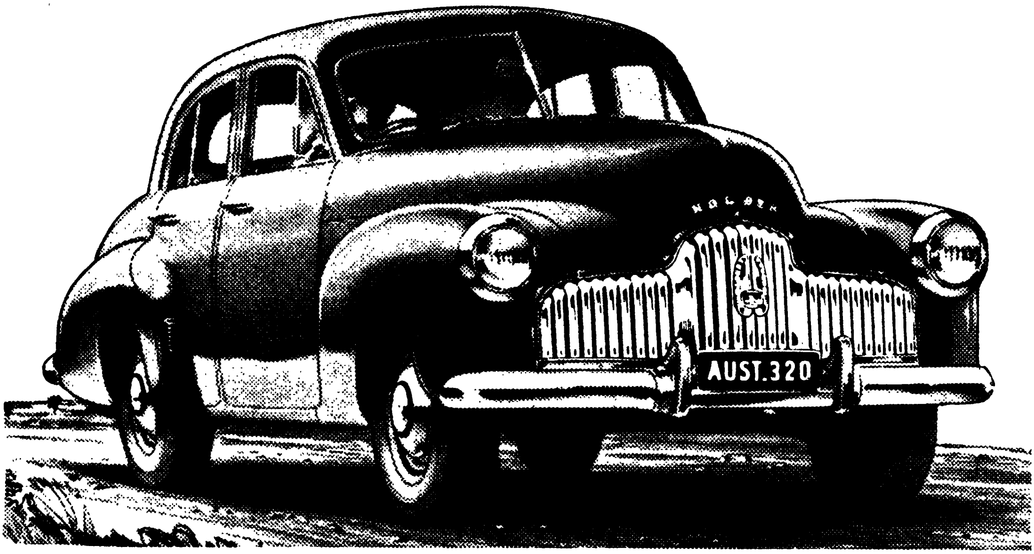

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(*Concluded from Vol.* 59 *page* 619.)

W. D. HARDY, B.Sc.Agr., H.D.A.*

THE natural pastures of the Southern Tableland are deficient in legumes, which are so important, not only because of their value as suppliers of proteins and vitamins for the use of dairy cattle and fat lambs, but also because they help to build up the fertility of the soils. It is the purpose of this article to describe the ways in which pastures on a number of properties on the Southern Tableland have been improved by the use of legumes. The instalments which have already appeared (in November and December, 1948 issues), have dealt with the general management of pastures for the maintenance of legumes and with the place of Subterranean clover in Southern Tableland pastures.

This concluding portion discusses the use of other clovers and legumes suited to the area.

White Clover (*Trifolium repens.*)

Next in importance to Subterranean clover on the Southern Tablelands, so far as area sown is concerned, is White clover. On the other hand, where White clover can be successfully grown it is of greater importance than Subterranean—because White clover is of higher feeding value, produces a greater bulk of feed and will grow longer into the summer. Subterranean clover withers and dies off rapidly on the approach of hot weather.

Generally speaking Subterranean clover can be grown over the whole of the Southern Tableland, but White clover is successful only in areas of good rainfall or in locations such as on river or creek banks where extra soil moisture is available. Robertson, Kangaloon, Moss Vale, Reidsvale, Adaminaby, Kybeen, and Cathcart are localities with soil and climatic conditions favourable for White clover growth.

Very few flourishing stands of White clover are to be seen in any of the above localities, but old hands relate that years ago the countryside was white with clover, in the spring. Many people are at a loss to know why the clover has disappeared from the pastures. Some suggest that the "seasons have changed"—but this is a great catchcry for man's ill-treatment of the soil.

The real reasons for the loss of clover are not very far to seek. Overgrazing by

*Mr. Hardy was, until recently, a District Agronomist with this Department, and was in charge of the Southern Tableland Area.

White Clover and *Phalaris tuberosa* in the Robertson District.
Subterranean clover also present to the same extent as White clover but did not show up as well.

stock (sheep, cattle, horses and above all, rabbits), and failure to use superphosphate and lime, or failure to maintain soil fertility are the main causes.

White clover can be quite successfully and cheaply regenerated in many of these "eaten out" areas by top-dressing with superphosphate, either with or without the application of more seed. Adding a pound or two of seed with the first application of superphosphate will cause the stand to thicken much quicker than by "supering" only.

A combination of Perennial rye grass and White clover is usually looked upon as being the best pasture possible. From a feeding point of view it provides a high yield of palatable, nutritious, well-balanced fodder, high in vitamin content, and thus is ideal for dairy cows and fat lamb raising; from the soil point of view, White clover is a heavy nitrogen and organic matter producer and so fertility is maintained at the highest possible level.

However, in the districts mentioned above as suitable for White clover it has been found that the ideal pasture sward is one containing White, Red and Subterranean clovers. With this combination a succession of green feed is obtained during a longer portion of the year. The Subterranean clover comes away with the first autumn rains, thus providing good autumn and winter feed, whereas White clover does not assert itself until spring and early summer. Red clover on the other hand is able to take advantage of summer rains and thus provides green feed when the other clovers have "hayed off."

Messrs. Churchill Brothers of Kangaloon, whose property has been highly pasture improved with Subterranean, White and Red clovers as the basis of the sward, have achieved an average annual milk yield, from their grade Illawarra cows, of over 650 gallons per head, when run almost entirely on pastures. White clover at 1 lb. and Subterranean clover at 2 lb. per acre has been used in the renovation of poor Kangaroo grass swards on the grey Wianamatta shale loams of the Moss Vale district during recent years, in order to build up the fertility of the soil prior to sowing the better types of grasses, such as Perennial rye and *Phalaris*. To date this combination of clovers has given very good results. This use of White clover to build up soil fertility prior to sowing down to better quality introduced grasses is practically a new innovation, as White clover was formerly generally regarded as a high-fertility-demanding species, and consequently the sowing of it was confined to 1 lb. or 2 lb. in pasture mixtures on good quality rich soils.

Once established, providing pastures are grazed judiciously and superphosphate applied each autumn or at least every second autumn, there is no fear of losing White clover from a pasture; in fact, the only fear is that the pasture sward may become clover-dominant in the spring.

When grazing stock, particularly cattle, on a succulent stand of White clover, great care must be exercised to avoid losses likely to be incurred through hoven or bloat.

Red Clover (*Trifolium pratense*).

While Red clover plants will live for two to three years and upwards, a certain amount of seed being set each year, it is found under grazing conditions, that from the third year onwards the number of plants in a sward is rapidly reduced until finally none remain. Red clover sets seed freely, but this species has not the same capacity of regeneration as White and Subterranean clovers in competition with other established clovers and grasses.

In spite of the relatively short time that Red clover remains as a component in a pasture sward, it pays to include 1 lb. or 2 lb. of seed in every pasture mixture as, apart from being a good nitrogen gatherer and thus a soil fertility builder, it makes its main growth during the spring and summer period when White and Subterranean clovers have "hayed off." Summer rains promote rapid growth in Red clover.

This capacity to produce summer feed is an important feature, particularly where dairying is concerned, as it ensures that a green pick of high protein feed is available all through the year. Thus, Red clover is able to bridge the gap between the spring and autumn growth of clovers.

Italian rye grass 8 to 10 lb. per acre and Red clover 3 to 5 lb. per acre (the amount depending on the percentage of clover desired in the resultant pasture) is a temporary pasture mixture which is becoming very popular on the Southern Tableland. It

is expected that this combination will eventually replace oats as a winter and spring feed proposition in certain areas, as this pasture is a particularly quick grower (when sown in February or early March it is ready for grazing in about ten weeks) and yields a large bulk of palatable and nutritious fodder of high feeding value which can be used for many purposes such as grazing, pasture hay or silage making. Italian rye grass—Red clover hay produced on Delegate Station has been acclaimed by one of Sydney's leading racehorse trainers as excellent for racehorses and "equal to New Zealand pasture hay."

Apart from its use for racehorses, Italian rye grass and Red clover provide one of the best rations for feeding dairy cows, baby beef raising, feeding ewes, rearing lambs and for fat lamb raising.

The Red clover in the mixture adds nitrogen to the soil, and after the second year when most of the rye grass will have disappeared, the Red clover can be ploughed in as a green manure crop. Thus the humus content of the soil is built up and enriched for the following crop or pasture.

Areas favourable for the growing of the Italian rye-Red clover pasture are: Robertson, Kangaloon, Mittagong, Moss Vale, Crookwell, Taralga, Reidsdale, Braidwood, Cathcart, Bombala, Nimmitabel and Delegate.

Red clover sown alone at the rate of 8 to 10 lb. seed per acre produces a stand from which heavy yields of high quality hay can be obtained, but such a practice is uncommon on the Southern Tableland—Subterranean clover for grazing and hay, or lucerne for hay and a fair amount of grazing, have greater longevity and are more economical.

Management of Red clover so that it may set seed is of little importance because, as mentioned previously, this clover does not regenerate readily from seed in an established pasture. Unlike White and Subterranean clovers, Red clover cannot be established unless sown in a well prepared seedbed.

Seed of Red clover is not harvested on the Southern Tableland.

An Improved Pasture on on Mr. S. Churchill's Property at Kangaloon. Includes Perennial rye and cockstoot grasses and Red, White and Subterranean Clovers.

Ball or Cluster Clover (*Trifolium glomeratum*) **and Lesser or Suckling Clover** (*Trifolium dulium*).

These two annual species of clover, whilst not of major importance, are of definite value in certain places on the Southern Tableland. Both species will grow satisfactorily in soil that is too low in fertility for the successful growth of Subterranean clover and hence they can be, and are, used to build up the soil fertility level prior to introducing Subterranean.

Wire grass or No. 9 (*Aristida* spp.) country on the Devonian sediments in the vicinity of Goulburn, low fertility country in the vicinity of Murrumbateman, Braidwood, Penrose, Peelwood, etc., are areas where the above practice is well worthy of adoption.

Two pound to 3 lb. of seed per acre of each of these species and 1 cwt. superphosphate should be renovated into the natural pasture during autumn—February-March is the most favourable period for sowing. The subsequent stand should be top-dressed in the autumn of each year with 1 cwt. superphosphate per acre.

On hard-baked soils ploughing or severe renovation, and seeding down with Wimmera rye grass may be necessary, as mentioned under methods of establishing Subterranean clover. The common practice on these poor soil types is to add a little Subterranean clover seed as well as the Ball or Suckling clovers. The idea is that, as the fertility rises, the Subterranean clover will gradually thicken up and eventually dominate the two other clovers.

On the better soil types, particularly the granite soils, natural Ball and Suckling clovers come away exceptionally well following the top-dressing of pastures with superphosphate.

In the stubble of well "supered" oat crops, Ball clover almost invariably forms a dense mat, thereby providing excellent stubble grazing as well as helping to maintain soil fertility by adding nitrogen and humus to the soil.

Pasture improvement by top-dressing the natural pasture annually with superphosphate has as its object the thickening up of the sward with these natural clovers—Ball and Suckling. Whilst this practice is the least desirable of all forms of pasture improvement, it is not to be condemned, but if possible it is preferable, on the better soil types, to aim at a Subterranean clover stand by sowing the seed with the first top-dressing.

Ball and Suckling clovers are short-lived annuals and do not give as heavy a yield of fodder as does Subterranean. Furthermore, whilst Ball and Suckling clovers seed prolifically, the seed, unlike Subterranean clover seed, is very small, and therefore it is of no value during the summer period when the top growth has disappeared. (See reference to Subterranean clover seed as a feed, in the Subterranean clover section of this article).

Strawberry Clover (*Trifolium fragiferum*).

Strawberry clover, a moisture-loving species, grows well on river and creek banks, around springs, soaks and dams, swamps, etc. Often in these positions other pasture legumes fail to persist; consequently, Strawberry clover could be more widely used in moist situations throughout the whole of the Southern Tableland.

Red Clover and Perennial Rye Grass on Mr. Herbert's Property at Kybean.

The cost of seed of this species is very high, but to overcome this disadvantage, farmers and graziers sow a small quantity, say ½ lb., in a small nursery plot from whence runners are removed from the parent plants and planted in the desired positions. The runners are "heeled in" with a hoe or mattock, at intervals of 4 to 5 feet. The addition of 1 cwt. superphosphate per acre ensures that the runners rapidly spread and so cover the intervening spaces. When runners are "heeled in", stock should be kept off the area until the new plants are well established, otherwise stock will seek out and pull up the young plants.

Palestine Strawberry clover, a strain tested during recent years by the Department of Agriculture, has given outstanding results on the Southern Tableland and it is strongly recommended that this strain only be sown. It produces numerous runners and leaves and gives a heavy yield of palatable and nutritious fodder.

Greater Lotus (*Lotus major*).

Whilst not considered as valuable as Strawberry clover, *Lotus major* should be

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more widely used in situations mentioned as being favourable to Strawberry clover.

Lotus major, like clovers, is a legume and consequently builds up soil fertility and provides protein in the leaves, which will help balance the ration provided by the poor types of grasses found growing in wet marshy areas.

The plant is established by scattering the seed among the natural herbage at the rate of 1 to 2 lb. per acre plus 1 cwt. superphosphate.

English Trefoil or Black Medic (*Medicago lupulina*).

Sowing of this species is uncommon on the Southern Tablelands as other legumes such as Subterranean and White clovers are superior types.

In early days, sowings of Black Medic were made, and now it is to be found growing naturally in small quantities on some of the better quality alluvial river and creek flat soils.

Barrel Clover (*Medicago tribuloides*).

Barrel clover, a relatively new commercial type of legume, does not appear to be likely to become popular on the Southern Tablelands. Trials to date, in the lower rainfall regions such as Goulburn, Yass, Canberra and Braidwood, have indicated that the growth of Barrel clover is very sparse and about equal in bulk to early strains of Subterranean clover. The period of growth and earliness of seeding characteristic in early strains of Subterranean clover are also manifest in Barrel. Due to the sparseness of growth and therefore low productivity of early strains of Subterranean clover, their use is not recommended—midseason or Mt. Barker types being much more profitable. On this assumption, Barrel clover does not appear to have a place in the pastures of the Southern Tablelands.

Another point against barrel clover is that under the same conditions as Subterranean clover it does not regenerate as well; in fact, regeneration of barrel clover over the last few years has been very poor.

(*Concluded*).

Ramie Can Be Grown Successfully in Australia.

RAMIE, a perennial shrub which is cultivated for the extraction of its excellent soft fibre, can be grown successfully in Australia on fertile, very well-drained land. The crop can be handled mechanically throughout, harvesting being done by means of the reaper and binder when the stems are about 6 feet high.

These conclusions have been reached as a result of experiments in ramie cultivation, carried out in the Lismore district.

The humid conditions prevailing in the semi-tropical climate of the far north coast are said to retard somewhat the success of processing of this fibre, being responsible for preventing the total removal of bark from fibre.

Cost of production is now under investigation. —DIVISION OF PLANT INDUSTRY.

New County Councils—For More Efficient Weed Control.

THREE new county councils are being formed in New South Wales with the object of placing constituent shire councils in a position to pool their resources so that full-time staff and satisfactory equipment can be brought to bear against the growing menace of weeds.

The Upper Macquarie County Council which will embrace the shires of Lyndhurst, Abercrombie and Oberon, is being formed for the purpose of controlling Yass River Tussock within the county district.

The county council to be known as the Castlereagh-Macquarie County Council, embracing the shires of Marthaguy, Wingadee and Walgett, and which is being formed mainly for the control of galvanised burr, is now in the final stages of formation.

The Central Northern County Council, another "Weed" county council, embracing the shires of Peel, Nundle and Tamarang, is also being formed. The headquarters of this council will be Quirindi and it will assume responsibility for control of all noxious weeds within the county district—DIVISION OF PLANT INDUSTRY

OAT AND BARLEY VARIETIES
Recommended for 1949 Sowing.

G. NICHOLSON, H.D.A., Cereal Specialist.

At one time oat growing was confined largely to the tableland and better rainfall districts. However, in recent years, the popularity of oats has increased enormously, notably in the principal wheat-growing districts. This has been brought about largely by improved varieties which have proved suitable to the drier districts. Oats now play an important part in crop rotations, to provide for winter grazing, and for fodder conservation as hay and grain. For best results varieties suited for the purpose intended should be selected for sowing.

OAT VARIETIES.

The following are the recommendations of the Department of Agriculture of varieties of oats for sowing in the 1949 season for different districts, and to meet varying requirements. Short descriptions of recommended varieties, and of some of the newer varieties, are also given.

North Coast.

Early Green Fodder—Sunrise, Buddah.

Grazing—

Early green feed—Fulghum.

Late green feed—Algerian.

South Coast.

Early Green Fodder—Belar, Mulga, Buddah.

Grazing—

Early green feed—Fulghum.

Late green feed—Algerian.

Northern Tablelands.

Grain, hay and grazing (autumn sown)—Algerian.

Grain or hay only (Autumn sown)—Guyra, Algerian.

Grazing only (Autumn sown)—Fulghum.

Grain or hay (spring sown)—White Tartarian, Lampton.

Central Tablelands.

Grain, hay and grazing—Algerian, Brigalow.

Grain or hay only—Lampton, Weston, Guyra.

Grazing only—Fulghum.

Southern Tablelands.

Grain, hay and grazing—Algerian.

Grain or hay only—Lampton.

Grazing only—Fulghum.

Grain or hay (in coldest parts for spring sowing)—White Tartarian, Lampton.

North-western Slopes and Upper Hunter.

Grain, hay and silage—Algerian, Belar, Burke, Mulga.

Grazing.—Algerian, Burke, Belar, Fulghum.

Central-western Slopes.

Grain, hay and silage—Algerian, Belar, Burke, Weston.

Grazing—Algerian, Burke, Fulghum.

Grain, hay and silage for drier areas—Gidgee.

South-western Slopes and Eastern Riverina.

Grain, hay and silage—Algerian, Belar, Burke.

Grazing—Algerian, Burke, Fulghum.

Western Plains and Western Riverina.

Grain, hay and silage—Belar, Burke, Gidgee, Mulga.

Grazing—Burke, Fulghum.

Murrumbidgee Irrigation Area.

Grain, hay and silage—Algerian, Belar, Burke.

Grazing—Algerian, Klein, Burke, Fulghum.

BARLEY VARIETIES.

The varieties of barley recommended by the Department are:—

Malting or two-row type—Pryor.

Feed or six-row type—Trabut (for green fodder or grain). Skinless (early feed coastal districts).

Notes on Recommended Oat Varieties.

Algerian.—A late maturing oat suitable for grain, hay or grazing in all parts of the State with the exception of the drier western areas. Although it does not produce such a bulk of early green feed as some earlier maturing varieties, especially if sown late, it recovers very well after grazing and can be grazed well into the spring. The straw is of medium height, fine, and produces excellent quality hay.

The grain is pale to medium brown, long, plump and is suitable for milling.

Algerian is susceptible to smut and to stem rust but has moderate resistance to leaf rust.

Belar.—A somewhat earlier variety than Algerian, which it resembles in its adaptation to a wide area of the State for cultivation as a general purpose oat. It is slightly taller growing than Algerian and has rather stronger straw, stands better and produces excellent hay. The grain is cream to pale brown in colour, long, plump and of good milling quality. As a grazing variety it cannot quite equal Fulghum or Algerian, but it produces greater early bulk than the latter variety and when judiciously grazed will recover well.

The variety is susceptible to stem and leaf rust, but has some resistance to smut.

Brigalow closely resembles Algerian, but is of later maturity; therefore it is considered suitable only for sowing in tableland districts. The straw is tall and strong, and not coarse. Has a brown, plump grain with a fine awn, and yields well under favourable conditions. For grazing, early growth is slow, but it provides good grazing and recovers well.

Brigalow has some resistance to smut, but is susceptible to crown and stem rust.

Buddah.—An early maturing oat particularly suited to growing on the coast as a green fodder and hay oat because of its resistance to leaf rust. It is not suitable for grazing because of the sparse tillering and poor recovery. The grain is plump and creamy white in colour.

Buddah is susceptible to smut and to stem rust.

Burke.—An early oat, with short, strong straw. Its outstanding characters are its moderate resistance to stem rust and its ability to hold the grain for long periods after maturity. The grain is rather small, but the husk is thin and the yield of groats higher than in any other commercial oat. The good characters of this oat warrant greater attention being given to it by farmers.

Burke is susceptible to smut and to leaf rust.

Fulghum.—An early maturing variety of pre-eminence as a grazing oat. It has superior recovery power to any other variety of similar maturity and produces a greater bulk of early feed than any other oat. The yield of hay and grain is satisfactory but the quality of hay is not as good as that of some other varieties. The straw is rather weak, especially after maturity. The grain is of good size, plump, brown in colour, but is rather short for the milling trade.

Fulghum is susceptible to stem and leaf rusts and to smut.

Gidgee.—An early maturing oat particularly suitable for hay and grain purposes in the drier districts. The straw is of medium height and of moderate strength. The grain is dark brown in colour, and usually very plump, but is rather short and small for milling purposes.

Gidgee is susceptible to stem and leaf rusts and to smut.

Guyra.—This was a selection made from the same cross as Gidgee, which variety it resembles; it is of later maturity and stools better. Time of maturity is similar to that of Belar. The straw is moderately strong, coarse and of medium strength. Early growth is palatable, being relished by stock, but it has not the same powers of recovery after grazing as Belar. The grain is dark brown, often of mottled appearance, plump, and of good quality, but because of irregularity of grain size, is not favoured for milling purposes.

Has some resistance to smut, but is susceptible to rust.

Lampton.—A somewhat later maturing variety than Algerian; its use is restricted to the tableland areas under which conditions it produces heavy yields of both grain and hay. It is not suitable as a grazing oat. The grain is slightly smaller than that of Algerian, but is usually plump and of good quality. It is shiny and of a pale brown colour.

Lampton is somewhat resistant to stem rust which renders it suitable for spring sowing on the Northern Tableland.

Mulga.—An early maturing oat suitable for grain or hay production in dry areas. As a grazing oat it produces a good bulk of early feed but recovery is poor. The

straw is rather weak and for this reason the variety should not be sown early in the season as rank growth and lodging will inevitably result. The grain is large, plump and of a creamy-white to pale brown colour.

Sunrise.—This variety is of early maturity. Its chief use is green fodder or silage on the coast where its resistance to leaf rust is of considerable value. The straw is tall and rather coarse and liable to lodging under conditions of excessive growth. The grain is large, plump and cream in colour.

Weston.—Intermediate in maturity between Belar and Algerian, Weston is a comparatively new oat likely to prove of value on the Central Tableland and the higher rainfall areas of the Central and Southern Slopes as a grain and hay oat. It has fairly strong straw of medium height. The grain is light brown in colour.

White Tartarian.—A very late maturing oat recommended only for spring sowing on the tablelands. It has tall, coarse straw and coarse foliage, and is characterised by the fact that all the grain is borne on one side of the head. The grain is white and plump, but somewhat small.

The chief value of this variety lies in its moderate resistance to stem rust which makes it suitable for spring sowing in the areas mentioned, but the coarseness of its straw and leaves is an objection, and it is likely to be largely replaced by rust-resistant varieties, such as Lampton, which have superior straw qualities.

Notes on Newer Varieties.

Alber.—An introduction from Argentine maturing about the same season as Belar. The straw is moderately short, fine and strong, producing a brown grain resembling Algerian. This variety provides fair grazing and recovers well.

It is fairly resistant to smut and crown rust, but susceptible to stem rust.

Ballidu.—A West Australian early-maturing variety ripening about one to two weeks earlier than Belar; the straw is fairly strong, purple, and medium fine. It produces a good bulk of early green feed with a broad flag, and has a moderately good recovery after grazing. The grain is of medium quality with a coarse awn.

Tests indicate that this variety has a good resistance to smut, but is susceptible to crown and stem rust.

Dale.—A cross between Mulga and Burt's Early, made in West Australia. This oat is of mid-season maturity, and produces a light brown grain which is heavily awned. Is considered a good grazing oat though probably not equal to Fulghum.

Dale is susceptible to crown and smut rust, and has some resistance to smut.

Klein 69B.—A promising variety from Argentine, generally fairly late maturing, resembling Algerian. The straw is of medium height, fine, purple and of moderate strength. Early stooling is satisfactory, and it provides fair grazing, but recovers only moderately well.

Has good resistance to crown rust, and some resistance to stem rust, and on this account may prove useful for coastal sowings.

Orient.—A Victorian variety bred at the Mallee Research Station by crossing Palestine and Dawn. It is of early maturity having a short, fairly strong straw and good stooling ability. Is suitable for grazing, possessing a good power of recovery. Because of its short straw, does not yield well for hay. However, the grain yield is good, producing a plump, nice quality grain.

PROBABLY brown lucerne hay would be more widely made, especially for dairy cows, were it not for the greater risk of loss by firing. The methods of cutting and curing are the same as in making green hay, except that the hay is not allowed to become so dry in the field. The risk of spontaneous combustion is therefore greater than in the case of green hay.

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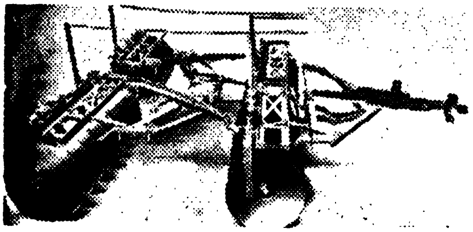
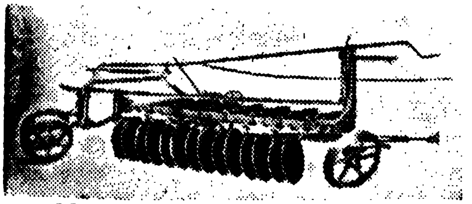
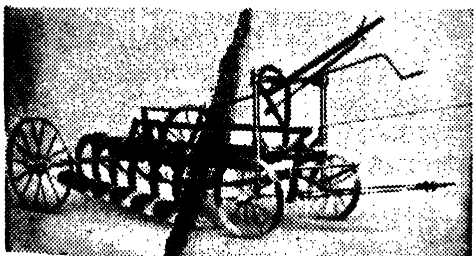


GL-9A Tractor Disc Harrow



GL-90 Stump-Jump Disc Cultivating Tractor Plough



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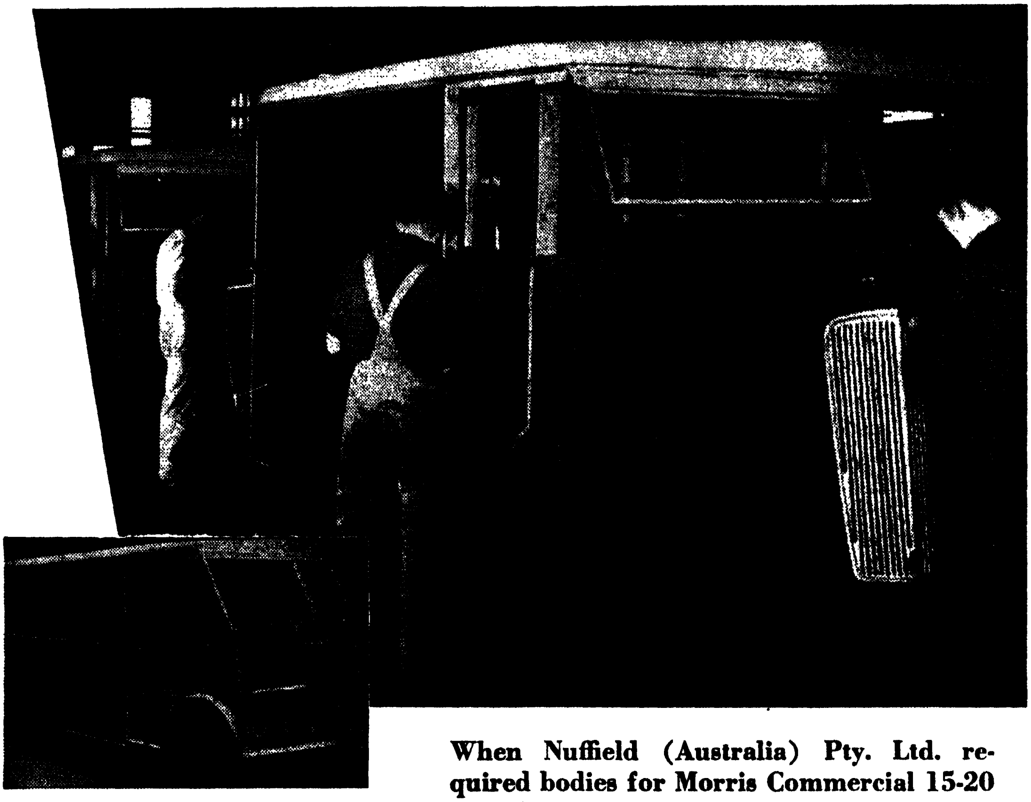

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THE FUTURE FOR WHEAT.

Supply Position Continues to Improve—But Prices Still High.

WITH the sowing season fast approaching it is worth reviewing the world wheat situation so that some indication of future supplies and price trends may be obtained, for, despite the Wheat Stabilisation Scheme, overseas prices still have a significant effect on the overall return to the Australian wheatgrower.

Some recent American comment has suggested that world wheat supplies may soon be large enough to meet any likely demand, and anticipating surpluses, United States authorities recommended a reduced acreage goal for 1949 United States sowings. However, although the supply position improved very greatly during 1948, there is no indication of any glut developing in the near future and, although prices will probably fall further during 1949, it seems most unlikely that Australia will have any difficulty in profitably disposing of all the wheat she can produce this year.

The World Position.

World wheat production in 1948 reached its highest level since before the war, and it is estimated that it was about 4 per cent. above the 1935-39 average. This appreciable increase in production over average pre-war figures was obtained in spite of the fact that European and Russian production was still substantially below the pre-war level; this was more than counter-balanced by greatly increased production in North America and by a significant, but smaller increase, in Asiatic production.

Production of rye, the other important bread grain, has not recovered to the same extent as wheat, and 1948 production, although greater than in any other recent year, was still well below the pre-war average. Rye, it should be noted, is of very great importance as a bread grain in Europe and U.S.S.R. In the latter country, rye production exceeded wheat production in 1946 and 1947. And, in spite of the fact that very little rye enters into international trade, the world wheat situation is directly affected by European rye production. If wheat and rye produc-

tion figures are considered in conjunction, it is seen that bread grain production in 1948 was slightly above the pre-war average figure. However, demand was very much greater, due to acute shortages of nearly every other type of foodstuff, a below average rice crop and a substantial increase in world population. It must also be realised that contrary to pre-war practice there were, and are, virtually no stocks of wheat to draw on in the case of emergency, anywhere in the world except for a very small quantity in the United States.

As was forecast last July, this improvement in the world wheat situation, which has been apparent for some time, but which it is now obvious is greater than was anticipated earlier, caused a fairly substantial fall in wheat prices during the latter half of 1948. Prices earlier in that year reached record levels, and despite quite an appreciable fall are still at very high levels. There has been very little change in overseas quotations during the past three months, and prices may be expected to remain fairly steady until some definite indication of 1949 Northern Hemisphere crops is available. Recent reports indicate another heavy United States of America crop and this, if combined with a European crop of similar magnitude to that of 1948 will almost certainly cause some further fall in wheat prices. However, despite the probability of a drop in wheat prices during the first half of this year, it is most unlikely that prices will fall to unprofitable levels in the near future.

United States—the Major Exporter.

Prior to the war the United States ranked fourth on the list of wheat exporters. During the current and two preceding years, United States exports have accounted for nearly half the world exports of wheat. She has thus displaced Canada as the world's leading wheat exporter, and in 1947-48 exported more than double the quantity of wheat exported by Canada.

The increased importance of the United States in the world wheat market is of great significance. The big rise in United States' wheat exports has been made possible by a succession of exceptionally large crops, and while another heavy crop appears probable this year, it hardly seems likely that the recent run of good seasons will continue indefinitely. The average United States' wheat yield in the decade 1929 to 1938 was 13.1 bushels per acre; during the past ten years the average has been 16.9 bushels. While this increase in yield is no doubt due in part to improved cropping practices and general improvements in farming methods, the primary reason for the increase is the succession of particularly favourable seasons which has been experienced. On recent acreages the United States' crop would be reduced by 200 to 300 million bushels if yields reverted to the pre-war average, and if a really poor yield were experienced there would be no export surplus available. Wheat importers have never been so dependent on one country as they are on the United States at present; for the next two or three years, particularly, that country's crop will have a profound influence on the world wheat market.

Another International Wheat Agreement?

Before this appears in print a conference of most of the leading wheat exporters and importers will have commenced. Its objective will be to hammer out a new International Wheat Agreement to replace the Agreement of 1948, which was not ratified by the United States and some of the smaller importing countries.

In view of the distinct possibility of a serious world wheat surplus developing within the next three to five years (but probably not before that time), a suitable Agreement could prove of considerable value to Australian wheatgrowers and the Australian economy as a whole. However, international arrangements of this type have always proved difficult of attainment in the past, and if, as in the 1948 Agreement, Argentina and Russia do not participate, there is room for some doubt of any agreement which may be reached proving effective in the long run. It must also be remembered that wheat prices have fallen appreciably since the 1948 Agreement was negotiated, and consequently Australian wheatgrowers must expect that if an Agreement is concluded the prices agreed upon will almost certainly be somewhat lower than in the earlier Agreement—P. C. DRUCE, Economics Research Officer.

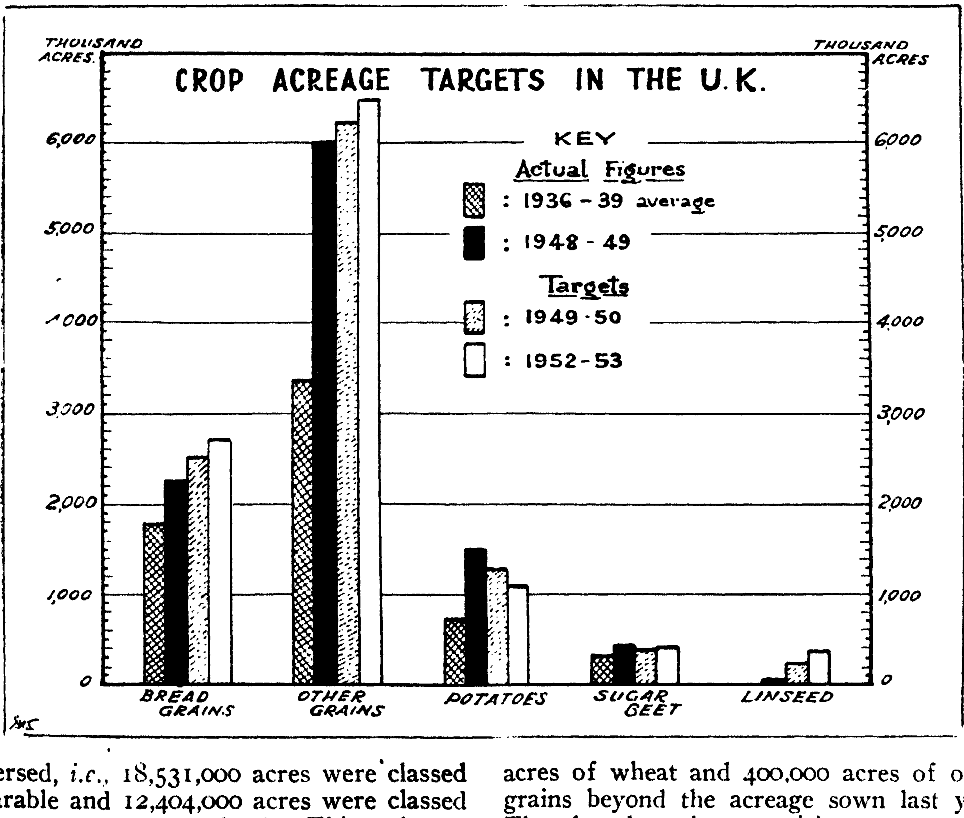
BRITAIN PLANS TO INCREASE FOOD PRODUCTION.

BRITAIN is by far the most important customer for Australia's primary products, and any significant variation in her attitude towards her own agriculture will, therefore, be of some moment to primary producers in this country.

Such a change in British agricultural policy was involved in the early post-war plan which aimed at increasing the agricultural output of Great Britain by about one-third over the pre-war level. The dollar crisis of 1947 precipitated further drastic changes to her agricultural policy. Whereas the first plan had aimed at increasing production without altering the traditional pattern of British agriculture, the four-year plan of 1947 subordinated all other considerations to the major objective of saving scarce dollars on imported foodstuffs.

Of the total of 31,679,000 acres of agricultural land, 12,906,000 acres were, in June, 1939, classed as arable land, and 18,773,000 acres as permanent grassland. Eight years later the total stood at 31,022,000 acres and the position had been reversed, *i.e.*, 18,531,000 acres were classed as arable and 12,404,000 acres were classed as permanent grassland. This change affords an indication of the emphasis which had, during the war years, been placed upon crop production.

In the present plan emphasis continues to be placed on increased crop production, as this offers the speediest and most effective remedy; farmers are required by 1952-53 to put 4,000,000 more acres under cereals than before the war. Included in this figure is a demand for 400,000 acres of linseed and also an additional 450,000 acres of wheat and 400,000 acres of other grains beyond the acreage sown last year. The plan thus aims at raising crop production as a whole to its wartime peak. Livestock expansion will be slower, but the plan has made provision for a rapid increase in the production of eggs and pigmeats as these offer the best opportunity of saving dollars.



The increase in acreage under crops will lead to a further reduction in pastures available for stock. The British Government hopes to overcome this problem by increasing the stock-carrying capacity of pastoral land by improved grassland management. Some excellent results were achieved in this direction during the war when the carrying capacity of grassland was increased by one-third, and it is generally agreed that much scope remains for further improvement.

If the plan is realised Britain's net agricultural output will soon be about 50 per cent. higher than pre-war, with opportunity remaining for further increase in livestock production which might eventually raise total agricultural output to more than 60 per cent. above the pre-war level.

For strategic as well as economic reasons Britain is thus making an all-out effort to raise home production, and the Australian farmer will naturally wonder if this means a reduced demand for Australian primary products. Such is the shortage of essential foodstuffs, it can be confidently stated, that Britain's purchases will remain high for some years to come. The long-term contracts already signed in respect of some major commodities, *e.g.*, eggs and meat, are re-assuring tokens to both parties.

However, Australia would do well to take note of the difficulties which beset British planners. Expanded agricultural output might be technically feasible, but uneconomic, that is, the desired expansion can only be achieved at high, or even prohibitive, cost. It is essential that Australia, more so than Britain, should be able to market her primary products at competitive prices.

The following extract from the article "How Much Food Can Britain Grow?" recently published in *The Economist** is worthy of full consideration, being no less applicable to Australia than Great Britain:

"The best form of State aid to agriculture would be subsidies for the improvement of fixed capital, the renovation of farm buildings, and the improvement of grass management, awarded on as selective a basis as possible. The concentration of economic aid to the industry in the form of price incentives is more likely to retard than to accelerate the necessary economic changes. It gives considerable security to the indifferent farmer, with the result that the differences between good and poor farmers—may be widening. It risks encouraging farming for quick returns instead of for durable results. It helps to inflate the capital values of many farms, a circumstance which may one day leave them over-capitalised yet short of the means for making necessary improvements. British agriculture is certainly capable of an appreciable and reasonable economical expansion —so long as it is gradual and balanced."—L. C. YORKE, Economics Research Officer.

* *The Economist*, London, 20th November, 1948.

TRENDS IN MILK PRODUCTION IN N.S.W.

ONE method of measuring the growth of the dairy industry in New South Wales is provided by figures of total milk production. This measure involves an estimate of the milk used for butter and cheese manufacture and whilst it may not, therefore, be 100 per cent. accurate, it does provide some interesting information regarding long-term trends in dairying in the State.

In 1902, one of the first years in which total milk production in New South Wales was calculated, slightly less than 106,000,000 gallons was produced. There was a rapid increase in dairy production during the next ten years and on the eve of World War I, 231,500,000 gallons were produced annually in New South Wales. Some decline occured during the war years, but from 1920 on, production increased again. This increase lasted until 1933-34 when 368.7 million gallons of milk were produced in New South Wales.

Since 1933-34 total milk production has declined steadily, reaching a relatively low point of 254,000,000 gallons in 1946-47. The decline in the later 'thirties is to a large extent the result of increases in the profitableness of other rural industries, which induced farmers to switch to other

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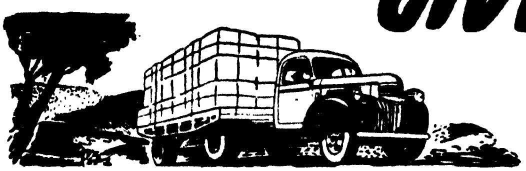

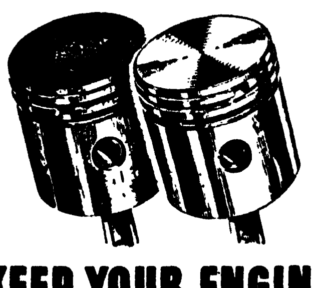

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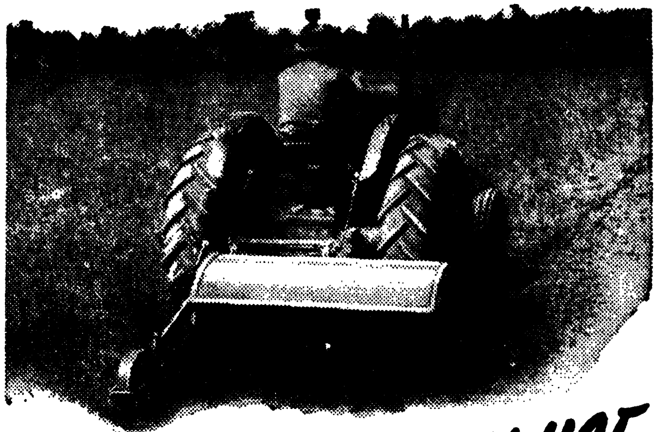

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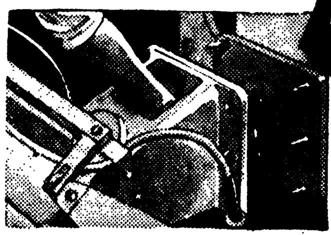

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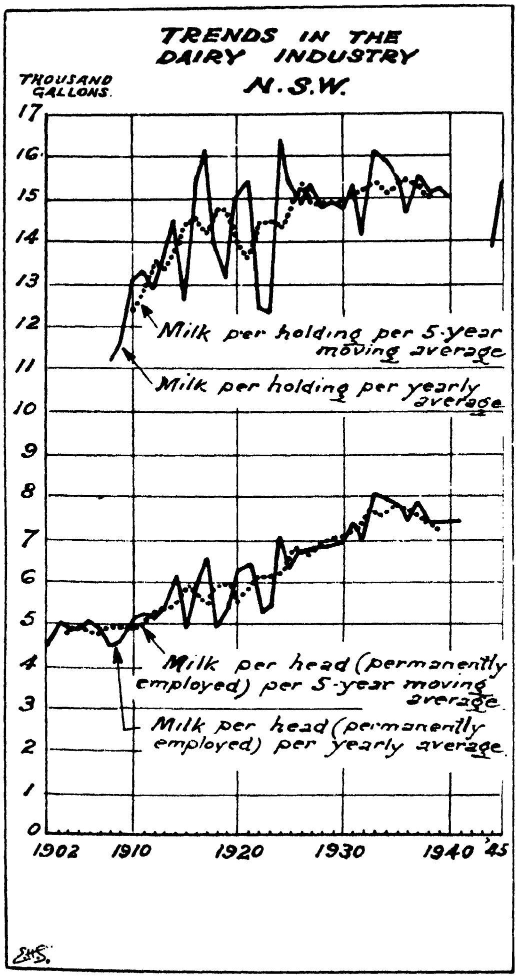
forms of rural production, and also to the fact that many farmers, especially wheat-growers, who during the worst period of the depression had kept a few cows to increase their cash income, ceased to do so when they felt more secure financially. During the war years shortage of labour and the greater profit obtainable from other rural industries were largely responsible for the further decline in milk production.



The latest figures for New South Wales show that the decline in dairy cattle population halted last year and, in view of the improved price now ruling, it seems likely that an increase in dairy production will take place in the next few years.

During the period (1902 to 1946-47) there was a very large increase in milk production per head. In 1902 there were 24,441 persons permanently employed (as owners, sharefarmers, tenants, wage earners, etc.) in dairying, producing less than 106,000,000 gallons. In 1940, 42,022 persons produced 308,000,000 gallons of milk. In terms of five-year averages production per head in dairying increased by 59 per cent. between 1905 and 1935. Since then there has been a slight decline until 1940—figures for the war years are unfortunately not available.

This increase in production per head is to a large extent the result of the introduction of milking machines which reduces the amount of labour necessary for the production of a given quantity of milk or butter-fat. The labour which is thus saved is largely female labour, and as a result there has been a considerable change in the composition of the labour force in the dairying industry. During the first decade of the twentieth century women accounted for about 45 per cent. of the total labour force, during the 'thirties less than 20 per cent. of the total labour force was female.

Another factor which has been responsible for increase in productivity per head is the increase in production per cow. It is hard to get at accurate and reliable figures of milk yield per cow, but the figures available to the writer suggest that production per cow increased by approximately 25 per cent. between 1900 and the later 'twenties. Since then, however, production per cow has fallen slightly.

Production per holding carrying on dairying has also increased during the last forty-five years, but this increase amounts to only 15 per cent. and is confined mainly to the earlier half of the period, *i.e.*, prior to 1925. As production per holding has increased so much less than production per head, it follows that the average dairy farm in New South Wales to-day employs less labour than it did formerly, and whilst production per holding has increased slightly, there has been little or no increase in the average number of cows per holding, the increase in milk production per holding being the result of increased production per cow.

Finally, mention should be made of the fact that these are only averages for New South Wales as a whole; there seem to be

(*Continued on page 95.*)

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Luddenham	February 11, 12
Pambula	February 11, 12
Paterson	February 11, 12
Dorrigo (H. S. Doust)	February 17, 18
Tenterfield	February 17, 18, 19
Candelo	February 18, 19
Gunning	February 18, 19
Wyong (F. Akhurst)	February, 18, 19
Cobargo	February 23, 24
Newcastle (P. Legoe)	February 23 to 26
Rylstone	February 25
Guyra	February 25, 26
St. Ives	February 25, 26
Yass	February 25, 26
Coonabarabran (M. J. Hennessy)	March 1, 2
Walcha	March 1, 2
West Maitland (R. E. Holroyde)	March 2-5
Bega	March 3, 4, 5
Glen Innes	March 3, 4, 5
Comboyne (W. R. Cooke)	March 3, 4
Penrith (A. Tornaros)	March 4, 5
Mudgee (H. A. Marsh)	March 4, 5
Queanbeyan	March 4, 5
Uralla	March 4, 5
Blayney (K. Gresser)	March 8, 9
Tumbarumba (Mrs. U. H. O'Shea)	March 8, 9
Cooma	March 9, 10
Blacktown	March 11, 12
Braidwood	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Moruya	March 11, 12
Gulgong (T. Amies)	March 12
Dunedoo	March 14
Gundagai (J. C. Saddler)	March 15, 16

Mendooran	March 16
Bombala	March 16, 17
Armidale	March 17, 18 19
Crookwell	March 17, 18 19
Binnaway	March 18
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Baradine	March 22, 23
Warialda	March 22, 23
Delegate	March 23, 24
Taralga	March 24, 25
Wauchope (L. Steel)	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Urbenville (S. Stoddart)	April 1, 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Grafton (C. C. Pitt)	May 5, 6, 7
Narrabri	May 6, 7
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7
Orange (N. J. Aird)	May 5, 6, 7
The Rock (O. L. Boyd and A. F. Walker)	September 17

Approved Vegetable Seed—February, 1949.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Cauliflower—

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Early Brown—R. C. Morandini, Box 74, P.O., Dubbo.

Crystal Grano—R. C. Morandini, Box 74, P.O., Dubbo.

Early Barletta—R. C. Morandini, Box 74, P.O., Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

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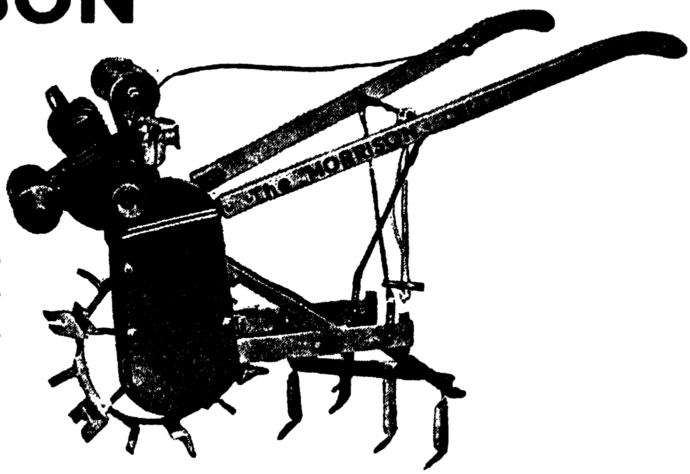

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SEED WHEAT AND OATS

For 1949 Sowing.

LIST OF GROWERS OF APPROVED SEED.

THE following is a list of growers of approved seed wheat and oats who have supplies available for sale. The crops of the growers listed have been inspected by officers of the Department and have reached a standard of purity and trueness to type up to the approved standard.

Growers listed should notify the Department immediately their available seed of any variety is exhausted.

WHEAT.

Bencubbin—
L. Winfield, "Wattle Park," Yenda.
M. Powell, "Myall," Narromine.
H. C. Wilson, "Bungey," Gilgandra.
H. H. Heath, "Eugilday," Leadville.
Leonard Bros., "Sommerfield," Birriwa.
D. R. Fraser, "Meriti," Albert.
S. M. and R. S. Noble, "Sunnyside," Eugowra.
Davy's Plains Pty. Ltd., Cudal.
A. J. Eggleston, "Golden Glen," Cumnock.
J. Keir, "Bogolong," Grenfell.
Estate T. C. West, Tubbul.
Stevenson Bros., "Glen Iris," Marrar.
C. S. Beck, The Gap Road, via Wagga.
Harper Bros., "Waratah," Albury Road, via Wagga.
J. B. Hart, "Carinya," Temora Road, Junee.
Brabin Bros., Eurongilly, via Junee.

Bordan—
A. J. Eggleston, "Golden Glen," Cumnock.
W. D. Blowes, "Strathmore West," Molong.
R. W. McLaren, "Glenmore," Barmedman.
W. Gibbs, Box 348, Griffith.
Harper Bros., "Waratah," Albury Road, via Wagga.
J. B. Hart, "Carinya," Temora Road, Junee.

Bungulla—
L. Winfield, "Wattle Park," Yenda.
W. J. Law, "Thistledown," Gilgandra.
M. Powell, "Myall," Narromine.

Celebration—
W. Gibb, Box 348, Griffith.
H. J. Harvey, "Kindalin," Dubbo.
S. M. and R. S. Noble, "Sunnyside," Eugowra.
A. J. Eggleston, "Golden Glen," Cumnock.
W. D. Blowes, "Strathmore West," Molong.
J. Scott, "Hillview," Wallendbeen.
R. Goodacre, "Penrose," Woodstock.
Stevenson Bros., "Glen Iris," Marrar.
A. J. Rodham, Uranquinty.
Harper Bros., "Waratah," Albury Road, via Wagga.
White Bros., "Braymont," Boggabri.

Charter—
S. M. and R. S. Noble, "Sunnyside," Eugowra.
Davy's Plains Pty. Ltd., Cudal.
C. S. Beck, The Gap Road, via Wagga.
White Bros., "Braymont," Boggabri.

Dundee—
C. S. Beck, The Gap Road, via Wagga.
Brabin Bros., Eurongilly, via Junee.

Ford—
H. J. Harvey, "Kindalin," Dubbo.
S. M. and R. S. Noble, "Sunnyside," Eugowra.
A. J. Eggleston, "Golden Glen," Cumnock.
W. D. Blowes, "Strathmore West," Molong.
W. Gibbs, Box 348, Griffith.
N. Davison, Cunningar.
J. Keir, "Bogolong," Grenfell.
Estate T. C. West, Tubbul.
A. J. Rodham, Uranquinty.
C. S. Beck, The Gap Road, via Wagga.
D. Chapman, "Inglewood," Spring Hill.

Gabo—
W. Gibb, Box 348, Griffith.
L. Winfield, "Wattle Park," Yenda.
D. R. Fraser, "Meriti," Albert.
N. Davison, Cunningar.
Stevenson Bros., "Glen Iris," Marrar.
A. J. Rodham, Uranquinty.
C. S. Beck, The Gap Road, via Wagga.
Harper Bros., "Waratah," Albury Road, via Wagga.
J. B. Hart, "Carinya," Temora Road, Junee.
Brabin Bros., Eurongilly, via Junee.
White Bros., "Braymont," Boggabri.

Gular—
L. Winfield, "Wattle Park," Yenda.
A. J. Rodham, Uranquinty.
White Bros., "Braymont," Boggabri.

Javelin—
H. C. Wilson, "Bungey," Gilgandra.
R. W. McLaren, "Glenmore," Barmedman.

Kendee—
W. Gibb, Box 348, Griffith.
L. Winfield, "Wattle Park," Yenda.
H. J. Harvey, "Kindalin," Dubbo.
W. G. Law, "Thistledown," Gilgandra.
H. C. Wilson, "Bungey," Gilgandra.
F. J. Simmons, "Merrybow," Tambar Springs.
Leonard Bros., "Sommerfield," Birriwa.
R. W. McLaren, "Glenmore," Barmedman.
S. M. and R. S. Noble, "Sunnyside," Eugowra.
Davy's Plains Pty. Ltd., Cudal.
A. J. Eggleston, "Golden Glen," Cumnock.
N. Davison, Cunningar.
R. Goodacre, "Penrose," Woodstock.

Kendee—continued.
J. Keir, "Bogolong," Grenfell.
Stevenson Bros., "Glen Iris," Marrar.
A. J. Rodham, Uranquinty.
C. S. Beck, The Gap Road, via Waggga.
Harper Bros., "Waratah," Albury Road, via Wagga.
J. B. Hart, "Carinya," Temora Road, Junee.
Brabin Bros., Eurongilly, via Junee.
White Bros., "Braymont," Boggabri.

Koala—
H. J. Harvey, "Kindalin," Dubbo.

Pusa 4—
White Bros., "Braymont," Boggabri.

Scimitar—
H. C. Wilson, "Bungey," Gilgandra.
N. Davison, Cunningar.

Yalta—
W. Gibb, Box 348, Griffith.
L. Winfield, "Wattle Park," Yenda.
W. G. Law, "Thistledown," Gilgandra.
M. Powell, "Myall," Narromine.
R. W. McLaren, "Glenmore," Barmedman.
S. M. and R. S. Noble, "Sunnyside," Eugowra.
E. Idiens, "Gangarooby," Goolagong.
Stevenson Bros., "Glen Iris," Marrar.
A. J. Rodham, Uranquinty.
Harper Bros., "Waratah," Albury Road, via Wagga.
J. B. Hart, "Carinya," Temora Road, Junee.
Brabin Bros., Eurongilly, via Junee.
White Bros., "Braymont," Boggabri.

OATS.

Algerian—
D. A. Cavanagh, "Yaralla," Ulamambri.
J. G. Blackmore, "Mt. View," Glendulla.
J. Wansey, "Abington," Tambar Springs.
R. W. McLaren, "Glenmore," Barmedman.
Davey's Plains Pty. Ltd., Cudal.
W. D. Blowes, "Strathmore West," Molong.
E. and N. Campbell, "Billabulla," Maimura.
Hall Bros., Wombat.
S. A. Cooper, Eurongilly, via Junee.
S. Todd, Mannus, via Tumbarumba.
A. J. Macrae, "Lucerne Vale," Mangoplah.
Higman Bros., Rannock, via Coolamon.
D. Chapman, "Inglewood," Spring Hill.

Ballidu—
J. Woodside, Boree Plains, Griffith.

Belar—
J. Woodside, Boree Plains, Griffith.
P. D. Crick, "Mayfair," Gollan.
S. C. Taylor, "Happy Valley," Wanga.

Belar—continued.
K. Maxwell, "Sansgrove," Gulgong.
D. A. Cavanagh, "Yaralla," Ulamambri.
J. C. Blackmore, "Mt. View," Clandulla.
J. Wansey, "Abington," Tambar Springs.
R. W. McLaren, "Glenmore," Barmedman.
E. W. C. Kingham, "Loloma," Tichborne.
W. D. Blowes, "Strathmore West," Molong.
M. Harriett, "Jumble Springs," Tullamore.
E. and N. Campbell, "Billabulla," Maimuru.
Hall Bros., Wombat.
S. A. Cooper, Eurongilly, via Junee.
S. Todd, Mannus, via Tumbarumba.
A. J. Macrae, "Lucerne Vale," Mangoplah.
Highman Bros., Rannock, via Coolamon.

Brigalow—
Davey's Plains Pty. Ltd., Cudal.
W. D. Blowes, "Strathmore West," Molong.
A. J. Macrae, "Lucerne Vale," Mangoplah.

Bunya—
G. Pfitzner, "Barunga," Griffith.
S. Todd, Mannus, via Tumbarumba.

Burke—
White Bros., "Braymont," Boggabri.

Dale—
J. Woodside, Boree Plains, Griffith.
E. W. C. Kingham, "Loloma," Tichborne.
S. A. Cooper, Eurongilly, via Junee.
D. Chapman, "Inglewood," Spring Hill.

Fulghum—
J. Woodside, Boree Plains, Griffith.
P. D. Crick, "Mayfair," Gollan.
K. Maxwell, "Sansgrove," Gulgong.
D. A. Cavanagh, "Yaralla," Ulamambri.
P. C. Blackmore, "Mt. View," Clandulla.
J. Wansey, "Abington," Tambar Springs.
R. W. McLaren, Glenmore, Barmedman.
E. W. C. Kingham, "Loloma," Tichborne.
M. Harriett, "Jumble Springs," Tullamore.
E. and N. Campbell, "Billabulla," Maimuru.
S. A. Cooper, Eurongilly, via Junee.
S. Todd, Mannus, via Tumbarumba.
A. J. Macrae, "Lucerne Vale," Mangoplah.

Gidgee—
G. Pfitzner, "Barunga," Griffith.
Higman Bros., Rannock, via Coolamon.

Guyra—
D. Chapman, "Inglewood," Spring Hill.

Mulga—
G. Pfitzner, "Barunga," Griffith.
J. Wansey, "Abington," Tambar Springs.
M. Harriett, "Jumble Springs," Tullamore.

Wongan—
G. Pfitzner, "Barunga," Griffith.

THERE are now nine calves by the imported Ayrshire bull, "Cornell Perfect Pilot," at Bathurst Experiment Farm. They are all fine specimens of the breed. It is hoped that the stock of this bull will improve the already excellent performance of the stud Ayrshire herd. The best cow in the herd is now giving over 5½ gallons of milk per day, and newly calved heifers are averaging 3½ gallons. The average cream test is 4.2 per cent.

LARGE AREA PASTURES

Under Irrigation

By the Contour System.

(Concluded from Vol. 59, page 568.)

F. AUTRY-HALL, H.D.A., District Agronomist.

IN the first portion of this article, which appeared last month, the author set out the advantages of the contour system for watering large areas of pasture in the irrigation districts, and described the construction of the banks and the application of the water.

In his concluding section he discusses the pasture species recommended for these conditions.

Types of Pasture.

1. *A mixture of* Wimmera rye grass, 2 lb.; mid-season subterranean clover, 2 lb.; lucerne, 2 lb.; and 1 cwt of superphosphate per acre is the cheapest to sow, and will provide autumn, winter and spring feed, with dry grazing through the summer months, the lucerne supplying some green feed during the latter period.

In dry seasons, two autumn and two spring waterings will be required—early March, and April-May; and August-September and early October, respectively. No summer watering is required, provided that the lucerne content is not more than a 2 lb. per acre sowing.

This mixture can be successfully sown dry, and "watered up"— a term used on the Murrumbidgee Irrigation Areas, meaning that water is applied to the land after the seed is sown in order to provide sufficient moisture for the germination of the seed and the early growth of the plant. The practice is to give the land as quick a watering as possible and also effect rapid drainage; as this is the initial watering it will take more water and more time to water than subsequent applications.

The carrying capacity of such a pasture when established is six to eight sheep per acre, provided that correct management is practised. This pasture requires topdressing annually with 1½ cwt. of superphosphate per acre, applied in early March; also it will be found necessary to renovate the pasture immediately after germination in the autumn in the third and succeeding years in order to prevent the Wimmera rye grass becoming too thick and the plants spindly in growth.

Farmers are advised to sow the greatest portion of their total pasture area with this mixture, as the water requirements are comparatively small—1¼ to 1½ acre feet in dry seasons.

(2) *Paspalum.*—Paspalum pasture has the highest carrying capacity of any irrigated pasture, and can be stocked with twenty to thirty sheep per acre during the spring, summer and autumn months, but gives very little winter grazing; however, it can be stocked during a wet winter or immediately after watering when other pasture would be harmed considerably. It can be sown in areas too low for other pastures, where it is convenient to water with surplus drainage water from less hardy crops.

This crop does particularly well when contour watered. The advantage is very noticeable on older stands which have become somewhat sodbound as the water may be held on the pasture sufficiently long to obtain penetration without waste. This grass lends itself to large contour bays. One grazier on the Wah Wah irrigation district has an area of 350 acres contoured and sown to paspalum, where a good stand has resulted from only four waterings per annum giving a carrying capacity of ten sheep for eight months each season during the past five years. The pasture was sown in 1939 with a cover crop of Sudan grass. It is estimated that the carrying capacity could be trebled by the application of a total of eight waterings per annum; however, in this case water supply is limited.

The writer considers that paspalum pasture is of such importance that every irrigated grazing property should lay down approximately one-fifth of the total irrigated pasture area with a paspalum-White clover mixture.

Paspalum will withstand more water than most pasture plants and is very tolerant to inferior soil types, but will certainly give better results when on a good soil that is comparatively well drained. It is a fallacy to consider this grass as one that is immune to scalding conditions.

Paspalum pastures will provide an abundance of feed throughout the summer, being particularly useful during the two periods of greatest shortage on irrigated properties where a Subterranean clover-Wimmera Rye mixture is the main grazing provided. Paspalum makes rapid growth during late October and November (the seeding time for the abovementioned mixture) and again during March-April (the early growth period of Subterranean clover Wimmera Rye)—when heavy grazing of such pasture is very bad practice.

Sow 8 to 10 lb. of *Paspalum dilatatum* with 1 cwt. superphosphate per acre in October-December, and topdress during the following April with 1 cwt. superphosphate, 2 lb. mid-season Subterranean clover and 2 lb. White clover per acre. Topdress every spring and autumn with 1 to 2 cwt. of superphosphate per acre.

This grass should be watered up. It is necessary to maintain a moist surface until

A Suitable Type of Water Check.
The first board is being inserted; the base board is covered with silt.

the germination of the paspalum seed is obtained; water requirements of an established pasture 2 to 3 acre-feet.

(3) *Lucerne.*—Sow lucerne under irrigation at the rate of 6 lb. per acre with 1 cwt. of superphosphate. Lucerne can be successfully sown after rain in the autumn (from March to May, inclusive) and in the spring, during August.

As lucerne is one of the most delicate crops to water, I would not advise farmers with large areas of irrigated pastures to sow more lucerne (lucerne only) than is required for cutting during the summer months. This crop is very easily spoilt by over-watering and scalding during the hot weather, and thus requires very careful treatment during the summer months. It should be sown in a moist seed-bed, that is, one having sufficient moisture to germinate the seed and support the plant during its early growth. In order to obtain this condition in very dry weather it is sometimes advisable to water the land, cultivate as soon as possible, and wait for rain before sowing the seed.

Lucerne is growing successfully under the contour system in the Mirrool Irrigation Area where good stands can be found, some of which are 100 acres in area and six to eight years old.

Success with this crop depends mainly on the selection of a suitable soil and the provision of efficient drainage. In order to obtain perfect drainage, adequate grading is essential, and the width of the bays should be limited to a maximum of 3 chains which will entail the erection of additional banks in some cases, thus splitting or reducing the contour. It is imperative that the upper delver furrow of the contour banks be kept clean and that a small drainage check be placed so as to drain the furrow into the drainage ditch.

Bays should be of such a size that watering and drainage are completed within eight hours; this may necessitate additional supply and drainage channels dividing the bays into two or more separate watering blocks or series.

(4) *Phalaris tuberosa.*—This grass, plus legumes, has a high grazing value during the whole year, but the greatest stocking is obtained during the cooler months. The grass is a hardy perennial, and will persist through protracted drought periods; it will also withstand a far greater amount of submergence by water than most plants. However, it has not proved suitable for the heavier types of soils, as they limit its

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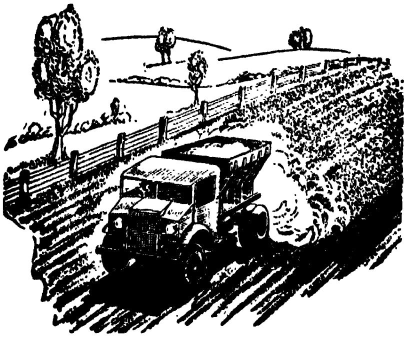

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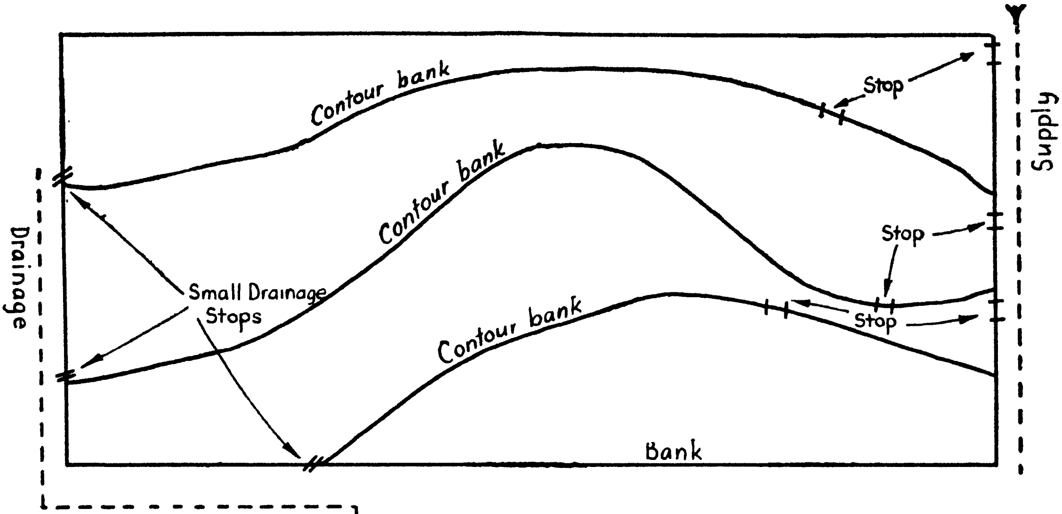


Diagram Showing Placement of Water Checks or Stops.

Three to each bay, except the last bay of the series for which only two stops are required.

NOTE.—In addition a small check is required through the lower bank of the lowest bay, into the drainage.

crown formation and stooling characteristics, thus resulting in reduced yields.

I would not suggest that growers should sow large areas, but at the same time a small area of 30 to 50 acres will be found of great benefit, provided that the soil type is suitable. Sow 2 lb. *Phalaris tuberosa*, 2 lb. certified White clover, 2 lb. mid-season Subterranean clover and 2 lb. lucerne per acre, with 1 cwt. superphosphate per acre in March or April. Sow in a moist seed-bed; topdress in March and August with ½ to 2 cwt. superphosphate per acre; water requirements 2 to 3 acre feet.

Seed-bed Preparation and Sowing.

The land should be left in a fallow after a shallow ploughing during the autumn preceding the sowing of the pasture; no workings will be necessary, other than for weed control. The best practice is to grade the rough ploughed surface. In cases where grading is not necessary a light smoothing will be found beneficial, as this will leave a firm seed-bed with a fine surface; such a seed-bed is considered ideal for pasture purposes. Where heavy winter rains are received following the initial ploughing, cross ploughing during the spring, before grading, is advised.

The seed should be mixed with the fertilizer immediately prior to sowing and sown through the fertilizer box of the drill. For safety, when the seed is sown in a moist seed-bed and no germinating water is to be given, it is advisable to drill to a depth of ½ to ¾ inch. Where a germinating watering is to be applied following sowing, the general practice has been to allow the seed to drop on the surface and cover lightly with the aid of wire-netting drawn behind the drill in place of the usual seed harrows. At Leeton Experiment Farm shallow drilling and watering up has proved a very satisfactory method in dry seasons.

Water Control Stops or Checks.

While banks may be cut into each individual bay, it is better that a suitable control stop be devised so that the watering is made easier for the attendant. Three stops per bay are required—two large and one small. The large stops are located, one as an inlet from the supply ditch and the other in the contour bank between the bays, located reasonably handy to the supply end (see sketch). The small stop, for which a piece of 4-inch waterpipe provided with wood plug is excellent, is located at the drainage end of the bay so

as to drain the lower contour bank delver furrow into the drainage ditch. This stop is only for the purpose of draining the small, remaining quantity of water which is slow to run off after the bulk of the surplus has been drained as portion of the supply to the next lower bay.

A suitable type of "check" for use in the control of water between the supply ditch and the bays, and through the dividing banks between the bays is easily made. It consists of two pine posts—3 feet long and 6 inches in diameter, set 2 feet in the ground, 30 inches to 3 feet apart, and grooved on the inside face—and a door that fits into these grooves. A base board of sawn timber (cypress pine) 6 x 2 inches is let 2 inches into the ground between the posts—so that the top surface is at ground level—and secured to the posts at each end. The door which fits flush on the base board can consist of several pieces of well-seasoned timber 1 inch thick, or can be built in one piece; the most suitable timber for this purpose is American redwood, but mountain ash is a fair substitute and much cheaper.

In use these stops are either fully open or fully closed, and must be of sufficient width to pass through the full supply of water without excessive depth; 6 inches of water over the base board is considered a maximum if scouring is to be avoided. Before the banks are consolidated it may be necessary to protect them close to the posts on the lower side of each stop, as wash is usually excessive during the first watering. Bags filled with sand or soil and placed in these positions will effectively prevent excessive erosion.

Acknowledgment.

I wish to thank Mr. R. M. K. Stannard, Farm Design Officer, Water Conservation and Irrigation Commission, for his co-operation in compiling the accompanying plan which shows both watering systems in use on adjoining areas of one property.

Zinc Deficiency of Linseed.

SYMPTOMS of zince deficiency have appeared in linseed crops in the Boggabri district. During a recent survey of crops in that district many crops were encountered that were dwarfed and showing a "club head" arrangement of the bolls —all bolls being on approximately the same level. Some of the shoots had died back and the middle and upper leaves were bronze in colour. These symptoms appear to be those associated with zinc deficiency and they correspond with those reported in flax in Victoria.

The Boggabri soils have an alkaline reaction which is a common characteristic of soils in which zinc is unavailable to plants.

It is of interest that in one paddock where a coil of galvanised wire was lying the surrounding linseed plants were normal, suggesting that sufficient zinc had been washed or splashed from the coil of wire to supply the plants' requirements.

Samples of soil from Boggabri are being studied in pot tests to determine whether the disease can be developed under controlled conditions and whether zinc salts added to the soil will prevent the disease.—F. C. BUTLER, Plant Pathologist.

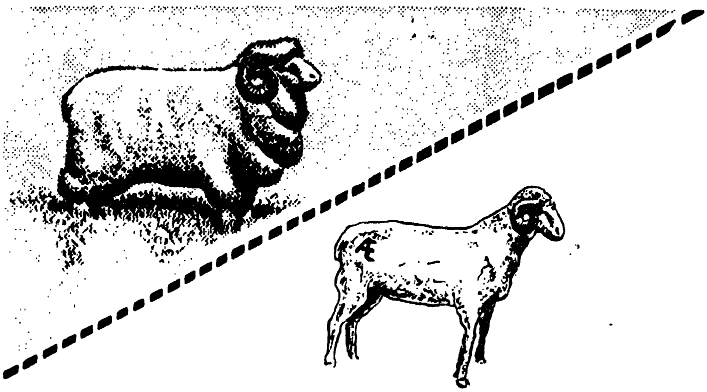
Tree of Heaven Killed by Hormone-type Weedicide.

EXPERIMENTS carried out at Wagga Experiment Farm have shown that both trees and suckers of Tree of Heaven (*Ailanthus glandulosa*) may be killed by the use of Methoxone—one of the hormone-type selective weedicides.

Tree of Heaven may, at times, become a nuisance, particularly in the vicinity of stockyards and in unused corners. Its prolific suckering habit has, in the past, made control particularly difficult, but means of successfully dealing with it have now been evolved in trials with hormone-type selective weedicides carried out during the past two years at Wagga Experiment Farm.

These trials showed that a 1 per cent. solution of Methoxone poured into a frill ring will kill trees of up to 5 inches in diameter, provided the application is made at the correct time (December to February); and that 0.5 per cent. water spray with Methoxone will kill suckers of up to 5 feet in height when the spraying is carried out in midsummer on a calm day when rain is not likely to fall for at least several hours. Sprays should be applied as a fine mist, sufficient spray material being used to wet the foliage without excessive run-off.

Results to date indicate that it may be at least twelve months after the spraying or frilling before an effective kill is obtained.—F. J. NICHOLSON, Agronomist.



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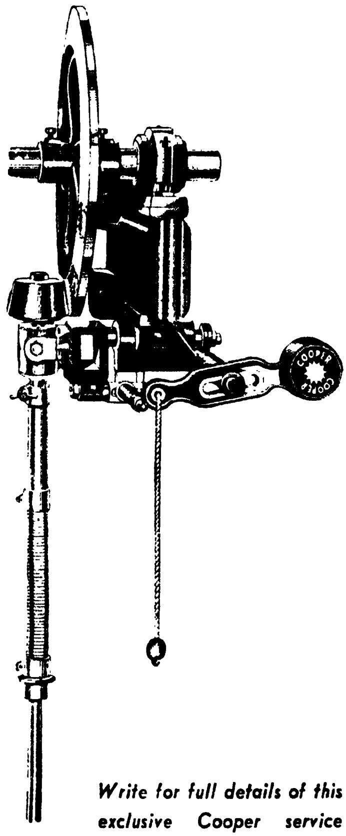

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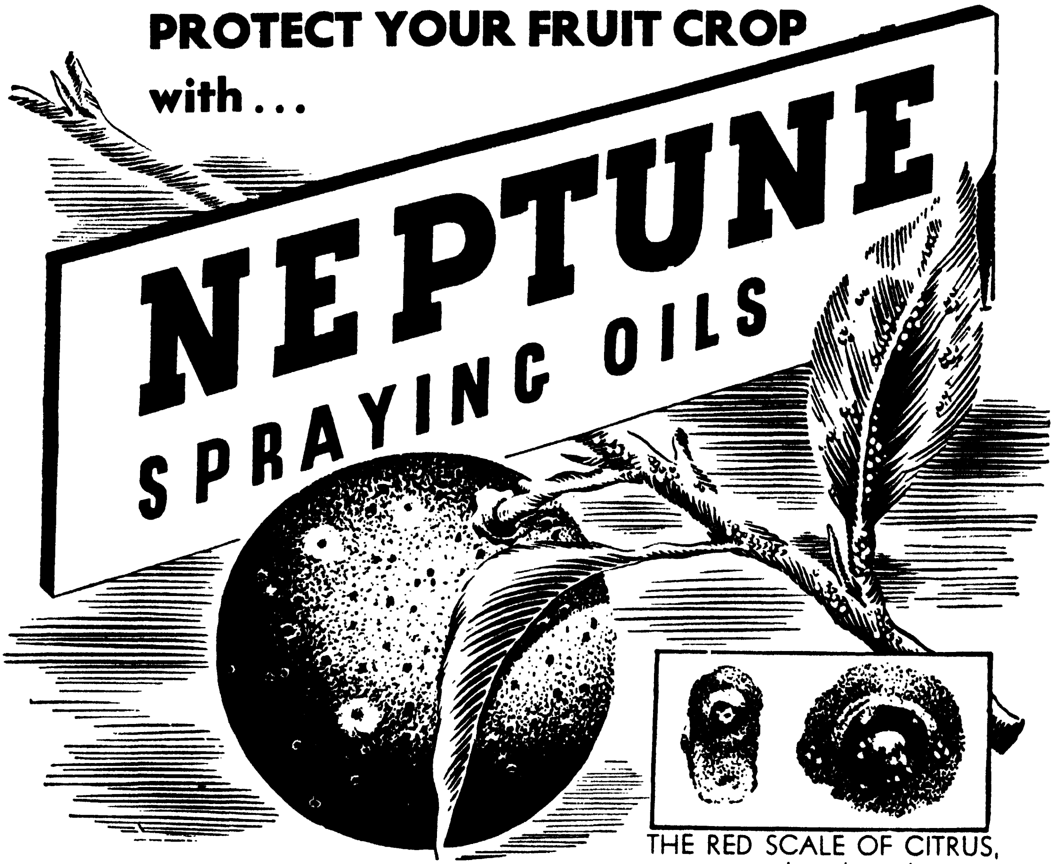

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PLANT DISEASES

SEPTORIA SPOT OF CITRUS FRUIT.

SEPTORIA Spot is caused by the fungus *Septoria depressa*. In New South Wales it occurs only in the south-western part of the State and periodically causes heavy losses in the Murrumbidgee Irrigation Areas and in the Upper Murray citrus-growing settlements. It has never been recorded on the coast.

Symptoms.

Spots produced by *Septoria* are typically round, dark brown and sunken. They may be small (Fig. 1) or up to ½ inch across or more (Fig. 2). They may be few and scattered (Fig. 2) or numerous and confluent (Figs. 1 and 3); sometimes they develop in streaks (Fig. 4), sometimes as large scald-like areas, probably associated with frost burns (Fig. 5). On the brown areas produced by the Septoria disease, the fruiting bodies of the fungus usually, but not always, develop as very small, closely-grouped black spots, just visible to the unaided eye. The infection extends deep into the rind, which is discoloured and greyish; the diseased tissue is often bounded by a thin reddish line.

Badly-infected fruits quickly develop off-flavour and usually fall prematurely.

A different type of infection (Fig. 6) sometimes develops, in which the spots are very small and often very numerous and almost superficial. It is thought, though there is at present no experimental evidence on this point, that the usual type of deeply penetrating spot results from early infection, and the smaller, more superficial type, from late infection.

Where the outbreak of Septoria Spot is only moderately severe, infection is heaviest on fruit around the skirt of the tree, and on the southern side. In years of severe outbreak, however, fruit in all parts of the tree are affected.

Comparison with Frost Damage.

The injury due to frost is not always easy to distinguish from Septoria Spot, and it may not be possible to do so without the aid of the microscope or by cultural tests. In Washington Navel oranges and lemons, various types of frost injury include rind breakdown, with which is associated mould

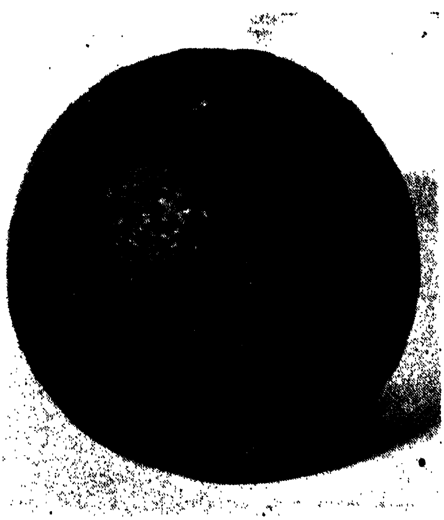

Fig. 1.—An Orange affected by Numerous Small Spots caused by *Septoria depressa*.

Fig. 2.—A Few Relatively Large Spots caused by *Septoria depressa*.

growth, superficial light brown scalding of the rind and brown and rather sunken spots usually lighter in colour than those caused by *Septoria*. In Valencias the most typical effect of frosting is development of dryness and a yellowish rind colour.

Fig. 3.—Numerous Septoria Spots Sometimes Fuse and cause Large, Irregular, Dark-brown, Sunken Areas on the Fruit.

Time of Appearance.

Symptoms begin to show in the winter and the development of the spots is almost always associated with a certain amount of frosting. Development slows up with the onset of warmer weather and ceases during September.

Source of Infection.

The fungus grows and fruits freely on twigs and fruit pedicels and on dead wood in and under the tree. Here spores are produced in quantity and splash on to fruit and leaves.

Time at which Infection Takes Place.

The fruit becomes infected during the late autumn and early winter, and possibly throughout the winter. No infection occurs during spring and summer or early autumn. The actual duration of the period of infectivity is not known, though it is thought most likely to be May and June. Nor is it known whether climatic conditions alone limit the period of infectivity or whether the maturing fruit is particularly susceptible at that time.

Conditions Necessary for Infection.

All fungous diseases of this type require moist conditions for infection to take place. Moist weather enables the fungus to produce spores, and permits the spores to grow on the fruit surface and penetrate the rind. These spores and the fungous growth made from them are very delicate and can live only in an atmosphere approaching saturation. Consequently, showery weather or long periods of dew are required. During spring and summer the air is mostly dry and there is little dew. The worst Septoria Spot outbreaks (1939 and 1948) have followed showery autumn seasons.

It is generally believed that frost injury is necessary before *Septoria* can attack the fruit. This is not so. Septoria infection does not follow frost injury. The fungus must be established in the rind before frosting; it does not invade frosted tissue after the damage is done. It is true that Septoria Spot develops very quickly in areas weakened by frost, but it does so from well-established infections already in the rind. The most that can be said is that

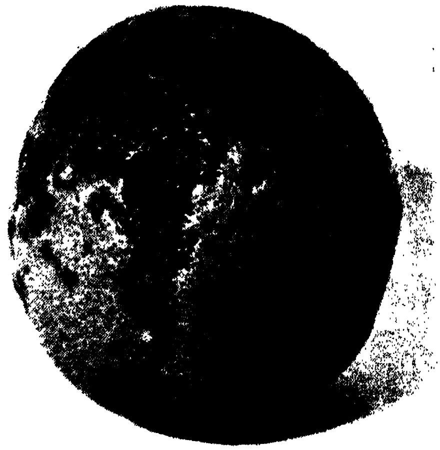

Fig. 4.—Drops of Water containing Numerous Spores may cause the formation of Sunken Brown Streaks on the Rind.

frosting which might not alone be sufficient to damage the rind seems to weaken it in a way that permits the rapid development of spots from infections already present. But Septoria Spot can develop very severely on fruit which shows no sign of frost injury at all. Furthermore, frost injury can occur without any *Septoria* development if the preceding autumn has been dry, or on the

Fig. 5.—Large Scald-like Areas are Probably Associated with Frost Injury.

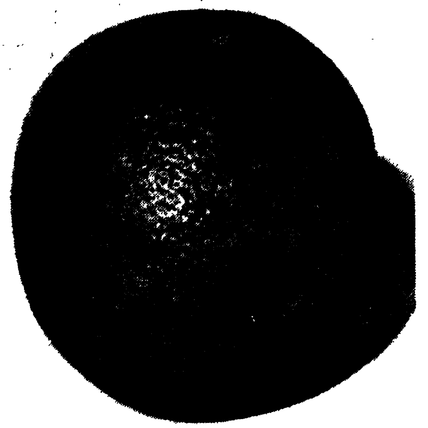

Fig. 6.—Small Superficial Spots Probably Indicate Late *Septoria* Infection of the Fruit.

fruit of young trees where there is not much infected dead wood and, consequently, little spore development. In these cases infection does not occur.

Control.

The recommended spray is Bordeaux Mixture 2½-2½-100 plus ½ gallon white oil. A single spray applied in mid-March will give full control. Those citrus growers who, because of the danger of scale build-up, wish to use a weaker spray are recommended to use Bordeaux 1-1-100 plus ½ gallon white oil or copper oxychloride 1 lb. per 100 gallons plus ½ gallon white oil. White oil is essential for good control. If desired, the Bordeaux or copper oxychloride sprays may be combined with a red scale spray, using 2½ per cent. instead of ½ per cent. white oil.

The Septoria Spot spray may also be combined with zinc spray for control of mottle leaf. The recommended spray is zinc sulphate 5 lb., copper sulphate 1 lb., hydrated lime 4 lb., water 100 gallons, plus ½ per cent. white oil.

Spraying must be done after, not before, fumigation, and sprays containing 2½ per cent. oil should not be applied later than March.

CONTROL OF FUNGOUS DISEASES BY SPRAYING.

THOUGH there are some important exceptions, the spraying of plants for the control of disease is successful only when the pathogenic agent is a fungus.

Fungi are lowly forms of plant life and differ from higher plants in many important respects, one of which is their inability to produce chlorophyll, the green colouring matter so obvious in the leaves of higher orders of plants such as the grasses and trees. By far the greatest number of species of fungi live on dead material and are incapable of attacking living tissue, whether plant or animal; but certain of them have developed the ability to overcome the natural resistance of some plants and to live and multiply within their leaves, stems or roots: they are then called parasites or, more correctly, pathogens.

Most Fungi Produce Spores.

Most parasitic fungi spend the winter months within the living, or dead, vegetable tissues and during the early spring give rise to small spores which correspond to the seeds of higher plants. These spores are disseminated by wind or other agents from plant to plant. With favourable conditions of moisture and warmth, the spores germinate and send out small branches which penetrate into the living tissues of the host plant and continue to grow there, producing more spores which are liberated into

the air or are washed by rain on to unaffected portions of other plants, where they again germinate, penetrate and produce a further crop of spores. In most cases the fungus grows entirely below the surface of the host plant and breaks through only to liberate its spores.

Fungicides Protect Crops.

In common with all forms of life, fungi are susceptible to destruction by certain chemicals which act as poisons. In the case of fungi, certain of these poisons, which are called fungicides, are non-poisonous or only mildly toxic to the host plant, and it is from this group of fungicides that sprays are prepared.

Since most plant pathogens, being internal, are protected from spray materials by the host plant itself, spraying is of little or no value in destroying an established parasite. However, if the surfaces of the host plant are kept covered with a thin coating of fungicide, the first branch which develops from a spore must grow through this film before it can enter the plant. During this process it dies. In many cases, the fungicide prevents the spore from germinating. Unfortunately, in practice, the perfect film of poison does not exist and if spores are sufficiently numerous in the air, some of them will fall on a crack in the film and, being unpoisoned, will be able to infect the plant.

Purposes of Spraying.

Spraying has two main purposes: (1) to protect the plant from infection by spores settling out from the air or rain; and (2) to reduce the number of points from which spores can arise on a plant, and thus, ultimately, to reduce the "spore-load" of the air or rain.

Because of these facts spraying must be regarded as a preventive and not as a cure for fungous diseases.

The timing of spray application is of the utmost importance. In agricultural districts there are usually sufficient spores of pathogenic fungi floating in the air to cause at least a light infection of any crop immediately the weather conditions favour the germination of the spores. If no protective spray has been used, and even a light infection takes place, there is an immediate build-up of the number of spores in the air and, if conditions continue to be favourable, a serious outbreak of disease will follow. However, if a film of spray is applied, before initial infection occurs, at intervals sufficiently frequent to assure that it is not washed off by rain and that all new growth is protected, infection will be kept at a low level.

Spraying Times Vary with Diseases and Hosts.

The correct time to spray varies for different diseases and for different crops and these facts must be taken into consideration before a spraying programme is commenced. The Biological Branch of this Department has available printed leaflets which fully describe the common disease of most plants and suggest the best times to spray.

Sprays Have General and Special Uses.

Many sprays of a highly complex chemical nature have been developed in recent years, but often they are useful in combating only a few specific types of fungi. Old established, relatively simple sprays, such as home-made Bordeaux mixture or lime-sulphur*, are still regarded as being highly efficient when properly used for a wide range of diseases.

* For various reasons growers are advised to use commercial brands of lime-sulphur rather than home-made. This does not apply to Bordeaux mixture.

Precautions Against Deterioration in Transit of Bananas.

To preserve the carrying qualities of bananas and minimise the likelihood of the fruit arriving at market in a mixed ripe or boiled condition, it is necessary for growers to observe the following points:—

1. All possible precautions should be taken to keep the fruit cool, especially in very hot weather.
2. Fruit should on no account be left in the sun without a suitable cover. A well-ventilated shelter is necessary in which to keep bananas until picked up by the carrier.
3. The time between cutting and the departure of the train or boat should be reduced to an absolute minimum.
4. On no account should fruit showing the first signs of ripening be packed with green fruit. All ripening fruit should be rejected.
5. Bananas should be protected from the weather during transit from the plantation to the point of loading.—DIVISION OF HORTICULTURE.

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Shellestone does not delay ripening. Fruit should not be allowed to hang beyond normal maturity.

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In addition to the main hormone constituent, alpha naphthalene acetic acid, Shellestone contains wetting and spreading agents to assist in thorough coverage and maximum effect.
Pour directly into the spray vat with agitators in operation. It mixes immediately with hard or soft water. It also combines readily with Shell Whitespray.

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FRUITGROWING

SUPPLEMENTARY WATERING OF BANANAS

To Overcome A Major Hazard to Efficient Production.

H. W. EASTWOOD, H.D.A.,
Special (Tropical) Fruit Officer and
J. W. JEATER, H.D.A.,
Fruit Officer.

No single practice carried out on New South Wales banana plantations will increase production to the same extent as supplementary watering. Not all growers will be located where sufficient water is available to irrigate, but the country where the banana thrives in this State is well laced with fresh-water streams and springs only needing storage development for a ready source of supply, and growers should take advantage of this fact. Also, growers must when selecting a site for future plantings, take into consideration the proximity of a water supply for irrigation purposes, in addition to the other natural advantages such a site must have.

For over thirty years banana production has been the livelihood of thousands of orchardists in the north-east corner of this State. In spite of the hazards that have been and still are associated with the industry, the grower willing to carry out sound practices in cultural methods, pest and disease control, packing and presentation of his product to the consumer can be confident that his position will be economically sound. He may be faced at certain times with marketing difficulties—even glut periods—but with a quality product to offer and high yields per acre such times will be safely negotiated.

During the history of the banana industry the major problem, bunchy top, has been overcome. Growers have at their disposal means of control for leaf-spot, speckle, squirter, beetle borer, etc., but to date comparatively few have faced up to that other major hazard, "dry weather," and supplement the natural rainfall with irrigation when the need arises.

It is not that this need only arises at wide intervals of time, for almost every year during the late winter, spring and early summer months plantations suffer from lack of soil moisture. These dry periods have particularly ill effects on sucker development and therefore ultimate bunch production. They also bring about premature ripening and force the grower to pack poorly-filled fruit All these things reduce acre yields both in quality and quantity.

Fig. 1.—Excellent Supply Hole from Which a Plantation Could Be Irrigated.

Fig. 2.—Permanent Water—Sufficient to Supply a Dam from which to Irrigate 10 Acres or More of Bananas.

Fig. 3.—A Concrete Wall Across a Small Gully Impounding a Supply from a Spring.

The Plantation Must Be Well Situated and Well Managed.

Although the advantages of judicious watering are beyond doubt the operation is not a cure for all ills. The costs of installation of a pumping plant and the reticulation system are only warranted on those properties that have the natural requirements of a good plantation, that is, freedom from frosts or chilling, correct aspect, altitude and suitable soil. Without these it will prove a costly error to install plant and fittings, but with such natural assets the extra yield and improved quality of the fruit will well repay the costs of irrigating.

Hand-in-hand with irrigation the grower will also have to keep his operations at the high level heavy production demands. Desuckering must be strictly adhered to, the application of greater quantities of artificial fertilizers may be entailed, and the control of leaf spot and other diseases and pests will be essential as conditions for their development may be prolonged or intensified with the increased period of growth and humidity.

Soil conservation practices can be more readily applied where irrigation is practised, for on steep slopes subject to torrential rainfall, annual or perennial cover crops are easily established and maintained, and such crops are the best means of checking soil loss in banana lands.

The Advantages Summarised.

The advantages of supplementary watering of bananas are:—

(1) Better sucker development.

(2) No choking of cavendish bunches during the year.

(3) Heavier annual production, with proportionate heavier production during months when prices are higher.

(4) Better filled, quality fruit and better grades to pack.

(5) Full beneficial results from other cultural practices.

(6) Improved value of the capital asset.

(7) A better opportunity to retain or improve soil fertility and reduce soil loss, hence longer economic life.

(8) Safety from fire risk to the plantation.

(9) The satisfaction and contentment that achievement creates.

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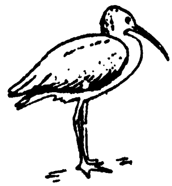

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Individual Installations are Necessary.

The prospects of having community storage and reticulation of irrigation water for banana growers' use seem very remote, and at present individual installations to suit a particular project will have to be relied upon. As each grower's requirements are liable to vary considerably and the available water sources differ in many ways, each irrigation lay-out should be considered according to its own merits and difficulties.

An Adequate Water Supply is Essential.

Before a decision is made to install a pumping plant, the first and most important consideration is the available water. An adequate supply must be on hand either with or without storage development to allow the application of one acre-inch per fortnight for periods up to sixteen weeks.

Available water occurs in various ways, viz. :—

1.—Permanent running streams with continuous flow for ample supply, or with sufficient flow to give that supply, provided storage dams are constructed.

2.—Surfacing springs where storage can be developed.

3.—Underground springs.

4.—Sub-surface water that can be tapped by spear points.

5.—Surface drains with pumping hole on flat country below the plantation to be watered.

Whatever the supply there must be enough water to irrigate the acreage decided upon.

Suitability of Pump and Power Supply.

The next point to be decided is the size and type of pumping unit and power needed.

Many pumps are on sale and differ in construction and purpose. They vary from centrifugal units with high rate of delivery but low lifts, to force pumps to work at high pressures for high lifts with comparatively lower delivery rates.

But the pump to be chosen is the one that will deliver water at the plantation level at a rate to allow application of 1 acre-inch, over the whole area, working 10 hours per day for 5 or 6 days. For example, for a 10-acre plantation, in 50 pumping hours per week, the unit should deliver approximately

Fig. 4.—A Free-running Sub-surface Spring which Supplies a Dam of 28,000 gallons Capacity shown in Fig. 6.

Fig. 5.—Developing Storage at the Underground Spring Site Shown on Fig. 4.

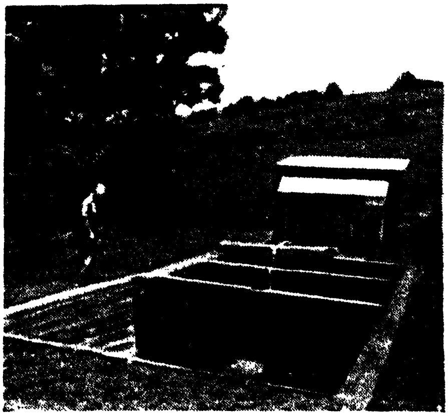

Fig. 6.—Pump House and Storage Well of 28,000 gallons Capacity.

Supplied by underground spring shown in Fig. 4.

220,000 gallons at the rate of 4,400 gallons per hour. If the pumping hours are increased over the weekly period, a unit of lower delivery rate can be used. For example, if 100 pumping hours can be worked the same watering can be given with a unit of 2,200 gallons per hour capacity.

Suitable power to drive the required pump may be from electrical or combustion motors. Expert technical advice should be sought before buying the plant.

An economic pumping plant should have the power and capacity to water the acreage planned without overloading the power unit or the pump. On the other hand, a plant with a much greater capacity and power than is required increases costs of installation, running and maintenance. Allowance should be made for loss of efficiency in the plant, and it is better to over-estimate on the required machines than to under-estimate.

The power unit and pump are not temporary installations, and their efficiency and life are dependent on the operator's appreciation of their requirements and of their need for regular maintenance and care.

The pumping site should be well above flood level, pump and engine well bedded, preferably on concrete, and the whole well protected from weather damage by erecting a suitable shed to house plant, fuel and oil.

(To be concluded.)

QUICK FREEZING OF FRUITS AND VEGETABLES
In U.S.A. and Canada.

(Continued from Vol. 59, page 468.)

S. M. SYKES, B.Sc.Agr., Fruit Officer (Research).

MR. SYKES returned to Australia early this year from an investigation of quick freezing methods in the United States of America and Canada. In previous sections of this article—in which he is describing his outstanding observations—he has discussed recent technical developments in the industry and methods of handling various fruits and vegetables during the freezing process.

The Selection, Harvesting and Handling of Fruit for Freezing.

The growing of suitable varieties in the proper localities, harvesting at the time of correct maturity, and satisfactory handling techniques are essential to high quality in frozen fruits. These points in relation to particular fruits are discussed below.

Strawberries.

Strawberries for freezing should have a pleasing, fairly strong flavour and acidity. They should have a bright red colour, preferably extending well into the flesh. The texture should be firm so that the product will not be too mushy on thawing.

Fig. 1—Three Varieties of Strawberry.

The variety Corvallis (*right*) has been bred from the varieties Marshall (*left*) and Ettersburg 121 (*centre*). Marshall and Corvallis varieties are both suitable for freezing.

[*After Waldo and Hartman.*

From a nutritional point of view the strawberry is rich in vitamin C, and in the rating of varieties for freezing, the vitamin C (ascorbic acid) content is often taken into account.

The varieties grown in America differ considerably according to the district. The Marshall strawberry is the principal one in the Pacific North-West and a large proportion of the total output of frozen strawberries consists of this variety. Other varieties which have done well, particularly in the south, are Blakemore, Klondike and Missionary. In New York state Julymorn, Marshall, Redheart, Redwing, Sparkle and Vanrouge have been rated as good for freezing. The varieties Vanrouge, Louise, Premier and Catskill have been found to be most suitable in Ontario.

Strawberries are picked in the Pacific North-West without caps, into 1 lb. veneer boxes (hallocks). These are brought to the stack in the field in wooden baskets and placed in trays—twelve hallocks per tray. The average picker picks about 150 lb. per day and a very good picker as much as 300 lb. per day. The trays are then transported by truck to the plant with a minimum of delay.

Bruising during handling must be avoided. If the berries must be held before processing, they can be stored for some hours in a cool spot in the plant or, if a storage period of a day or so is anticipated, then they should be placed in a cool room at about 32 deg. Fahr.

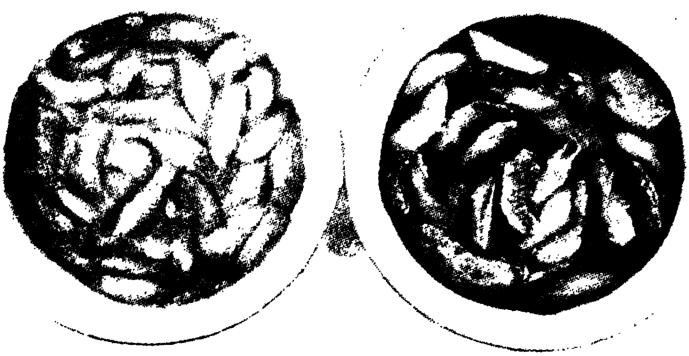

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Fig. 2.—Comparison of Two Peach Varieties after Freezing and Defrosting.

Variety (1) shows little discoloration, while (2) has browned badly.

[*Courtesy of Frt. Prods. Journ.*

Red Raspberries.

Varieties for freezing should have deep colour, rich flavour, resistance to bruising and flesh which does not collapse on thawing, and should not be seedy. The variety Washington is grown widely in the Pacific North-West for freezing purposes and has almost completely replaced the Cuthbert variety which has been eliminated because of its low winter-hardiness. These two varieties, together with Viking and Lloyd George, have yielded very satisfactory frozen packs in a number of states.

Raspberries are harvested when firm-ripe, sweet and showing full characteristic flavour. Pickings should be frequent and thorough to avoid over-ripe or mouldy berries. Bruising is avoided as much as possible since raspberries are particularly susceptible to mechanical injury. If holding before processing is necessary the berries are stacked in a cool part of the plant or, preferably, in a room at 32 deg. Fahr.

Blackberries and Dewberries.

The desirable varietal characteristics of these berries are even ripening, resistance to bruising, fleshy texture, lack of tough core, rich colour and distinctive flavour. Of the cultivated blackberries, the Oregon Evergreen, Himalaya and Pacific have been suitable for freezing. In the dewberry group, the Boysenberry, Youngberry, nectarberry, loganberry and Cascade possess very good quality and are well adapted to freezing.

The berries are picked when showing full colour and when the appearance of the skin has changed from a bright sheen to a velvet gloss. The flavour should be sweet and non-astringent. Several pickings are made so that berries of the correct maturity can be obtained. The handling and storage before processing is similar to that of other berries.

Peaches.

Much work has been carried out on the varietal suitability of peaches for freezing, and the results from different districts emphasise the fact that most varieties must always be considered in relation to a particular growing area. The varieties which have given good frozen products are mainly yellow-fleshed, freestone types. Some of the most outstanding and widely grown of these varieties are J. H. Hale, Hale Haven, Redhaven, Dixigem, Rio Oso Gem, Veefreeze, Valiant, Vedette and Elberta.

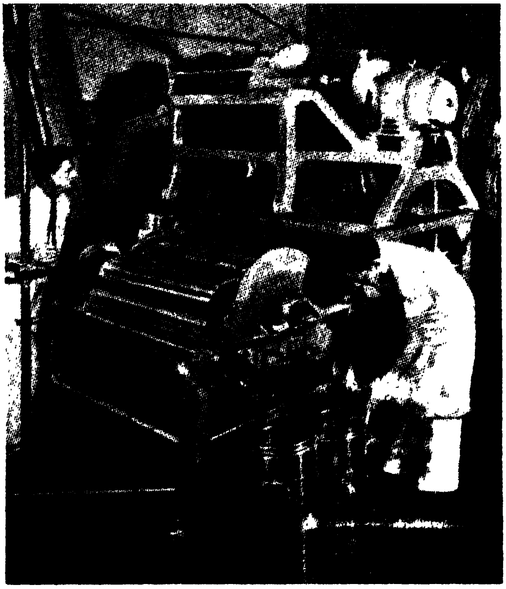

Fig. 3.—Citrus Juice Extraction and Straining Equipment [Courtesy of Frt. Prods. Journ.

The suitability for freezing is associated largely with the degree of browning (content of catechol tannins), but a peach which is good for freezing may not be satisfactory from the grower's point of view. For example, the variety Sunbeam does not discolour on exposure of the cut surface to air but, at present, it is not extensively planted because of its low yield, weak flavour and slightly flabby texture. On the other hand, Elberta peaches have a tendency to brown badly if not properly treated but they are frozen in large quantities in New York state because of the large production.

Other points which determine suitability for freezing are flavour, ease of peeling and pitting, bright yellow or white flesh colour with red centres and uniformity of ripening.

Peaches intended for freezing are harvested when full-ripe. Growth and the development of colour and flavour should be at a maximum and the fruit should be still firm enough to be picked and handled with a minimum of bruising.

Cherries.

The most suitable cherries for freezing in America are the sour (R.S.P.) types, the main variety being Montmorency. (Sour or "pie" cherries are not at present grown commercially in Australia.) Sweet cherries are not well adapted to freezing because of the oxidative changes (browning and flavour changes) that occur during freezing and thawing. The varieties Napoleon (Royal Anne), Lambert, Bing, and Black Republican have given fairly satisfactory products.

Proper maturity at harvesting is essential. Sweet cherries should be picked when firm but "full-ripe," *i.e.*, slightly later than is usual for marketing in the fresh condition.

Apricots.

The varieties Tilton, Royal, Blenheim and Moorpark have given satisfactory frozen products. Apricots should be harvested when "firm-ripe" and showing very little green colour. Varieties which do not ripen evenly are undesirable for freezing.

Apples.

Apples which give good pies are normally used for freezing. Jonathans and Stayman Winesaps have given good products. The varieties Delicious and Rome Beauty are inclined to be too soft. The freezing of applesauce in consumer-size packages is increasing and, for this purpose, tart varieties such as Gravenstein and Yellow Newtown are most suitable.

Pineapples.

Pineapples of the smooth Cayenne variety have given good frozen products.

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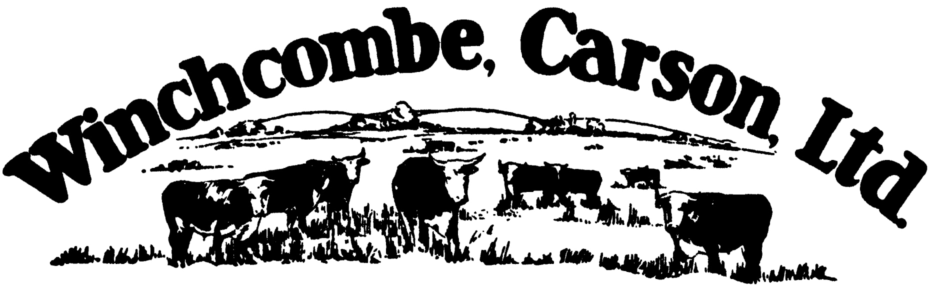

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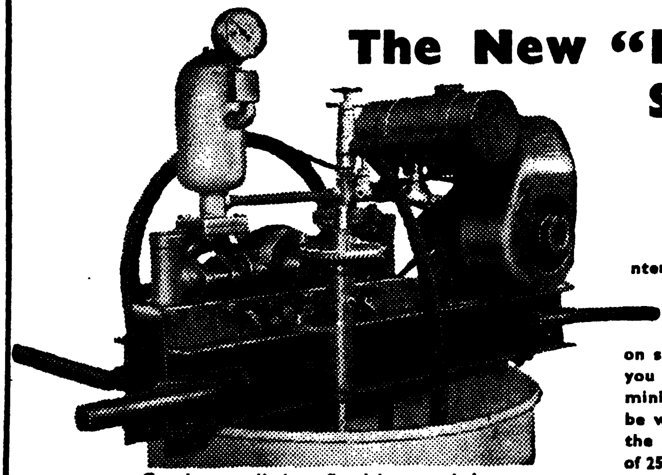

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Figs.

In California, the variety Black Mission has proved best for freezing. The Calimyrna (a modified Smyrna fig) is widely grown for drying, but is not ideal for freezing because of its tough skin and prominent seeds.

Figs are picked for freezing when they have reached the "soft-ripe" stage.

The Freezing of Fruit Juices.

The total quantity of fruit juice preserved by freezing is not large at the present time and, of this quantity, citrus juice constitutes by far the major part. Apple, grape, cherry, berry, tomato and pineapple juices can be frozen, but the production is not likely to expand since the canned articles are very satisfactory. Frozen citrus juice, however, gives a distinctly better-flavoured product than canned juice.

Frozen Orange Juice.

The large-scale freezing of orange juice for householder consumption was attempted in 1931. One of the large dairy companies began marketing frozen juice, together with milk products. The project was a failure—largely because of the difficulty of thawing out the juice in the home. If the juice was delivered in the thawed state, there was always the danger of spoilage or, at least, of deterioration. The quality of the frozen juice was not in question and had nothing to do with the failure of this scheme. Since then, other companies have taken up the freezing of citrus juice but production is fairly restricted.

In the past two or three years there has been a definite "slowing-down" in sales, which has been attributed to the big supply and low prices of canned juice. However, the future appears to be fairly bright although the expansion will be slow and will require sound planning and promotion.

Extraction and Preparation of Orange Juice.

The procedure of a large Californian plant is as follows:—

On arrival at the plant, fruit from different growers is held in bins. Chemical determinations of total acid, sugar, total solids and ascorbic acid are made for each grower-lot. The fruit is then blended to give juice of a definite composition which is based on consumer preference.

The fruit is inspected, thoroughly washed and dried. After being size-graded, the oranges are halved and the juice extracted on a Brown reamer. The juice is strained and then deaerated.

After being pre-cooled to 36 deg. Fahr., the juice is filled into enamel-lined cans, which are delivered to a Finnegan tubular freezer where they are frozen in an alcohol bath at minus 40 deg. Fahr. The frozen juice is stored at 0 deg. Fahr.

Frozen orange juice is packed in enamel-lined cans, "Canco" containers (fibreboard body-metal ends), "Cellophane" bag-in-cartons, paper milk bottles and glass bottles. It can be frozen in conventional air-blast freezers, immersion freezers or, before packaging, in ice-cream freezers.

Frozen Citrus Concentrates.

Both in Florida and California there has been some development in the freezing of citrus juice concentrate. The advantages of this product are: (*a*) Its flavour is very close to that of fresh juice; (*b*) it is soft even at 0 deg. Fahr., and can be "spooned" out of a can and mixed with water, and thus requires no long thawing period; and (*c*) there is a saving of storage space.

The usual concentrate has a solution ratio of 4:1, *i.e.*, four parts of juice are reduced to one part of concentrate. In preparing the product for consumption one part of concentrate is mixed with three parts of water.

(*To be continued.*)

Business of Farming—*continued from page 77.*

significant variations between different Divisions; on the North Coast for instance (*i.e.*, from the Macleay River northwards) there has been no increase in milk production per holding and the increase in milk production per head in this area has been much less than in other areas.—F. H. Gruen, Economics Research Officer.

INSECT PESTS.

Notes contributed by the Entomological branch.

THE GREEN VEGETABLE BUG

(*Nezara viridula*).

IN New South Wales, this bug, which becomes most numerous during the months of February and March, is mainly a pest of beans and tomatoes. Occasionally, however, it causes considerable damage to other crops.

Amongst other plants that may be attacked are cauliflower, melons, potatoes, pumpkins, spinach or silver beet and squashes. Grapes, oranges and passion fruit, lucerne, maize and various ornamental garden plants and weeds, etc., may also be infested.

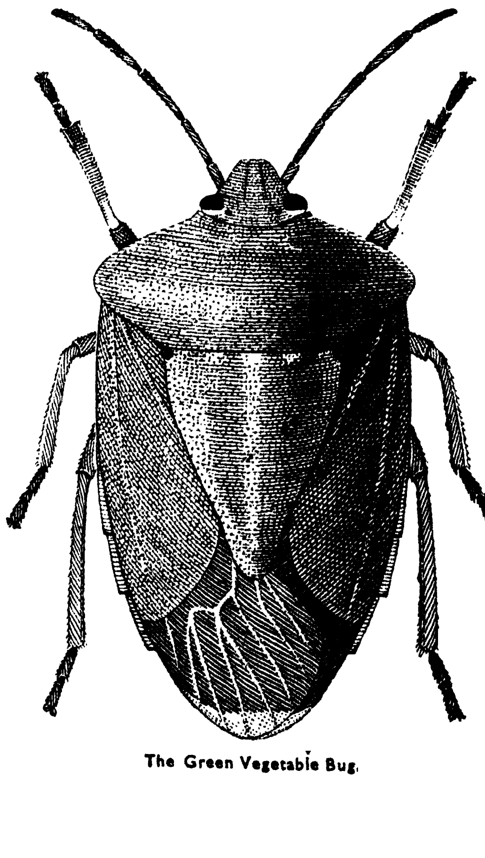
The damage is caused by both immature and adult bugs piercing the plant tissues and sucking up the sap. Although all parts of the plants may be attacked, the most noticeable damage is caused to the young shoots or the more delicate portions. Where beans are infested the bugs prefer to feed on the young bean pods and as a result they become shrivelled and distorted. Well-developed bean pods may become pale-coloured, or dry and blotched in appearance. When tomatoes are attacked the fruits become mottled and discoloured.

The green colouration of the adult bugs harmonises so well with that of the foliage of the plants that they are not readily seen, even when large numbers are present in a crop. Where infested plants are disturbed the bugs have the habit of either dropping to the ground, or arresting their fall by clinging to some lower portion of the plant with which they come into contact.

The adult bug is a shield-shaped insect, about ⅝ inch in length, and of a uniform green colour, but during the colder months they may become dull brown or purplish. They overwinter in the adult stage and commence to lay their eggs about the middle of September.

As many as four generations may occur during the season and egg-laying is continued by each successive generation until about the end of April. As many as four batches may be laid by an individual female.

The eggs are laid in compact clusters, and are placed in regular parallel rows firmly glued together and to the surface upon which they rest. Each cluster contains from forty to eighty eggs. The eggs are pale yellowish when first laid, but as the embryo



The Green Vegetable Bug.

D.D.T.

(dichloro—diphenyle—trichlorethane)

NO VERM DUST (2% D.D.T.)
CABBAGE DUST (2% D.D.T. with GAMMEXANE)
TOMATO DUST No. 2 (2% D.D.T., 40% Sulphur, 8% Copper Oxy-Chloride)
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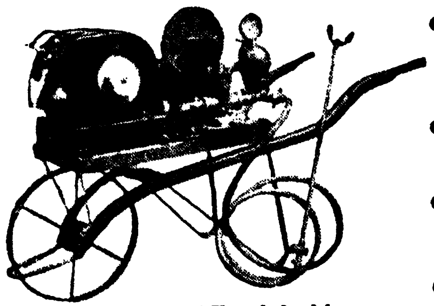

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bugs develop within they become pinkish and gradually darken until, just before hatching, they become reddish-brown in colour.

The incubation period is usually from five to eight days, and the young bug, when ready to emerge from the egg, pushes off the circular cap or lid on the top, by means of a special egg-burster, and crawls out of the shell which then resembles a small glassy cup.

The young bugs, often, are not recognised by growers as the immature forms of this pest. They are of a general bright orange colour with darker markings, and later, in their different immature stages, are marked with red, green, yellow, orange and black.

The young bugs, which at first measure about 1/16th inch in length, cast their skins five times before reaching the adult winged stage.

The life-cycle of the bug, from egg to adult, occupies from five to eight weeks.

Control.

In coastal areas this pest, in most seasons, is largely controlled by the introduced wasp parasite *Microphanurus basalis,* the larvae of which develop within the eggs of the bug. In inland areas, however, this parasite does not appear to survive, in any numbers, from season to season. Eggs that have been parasitized lose their yellowish or reddish colouration and become grey or almost black.

Control may be obtained by spraying with 0.1 per cent. DDT emulsion—4 fluid oz. of a 20 per cent. DDT emulsion to 5 gallons of water.

When DDT is used on bean crops the plants should be treated at blossoming time or while the pods are still very small, in order to avoid the danger of poisonous residues occurring on the pods. Crops ready to harvest should be picked over heavily before applying DDT. If spinach or silver beet plants are treated with DDT, unless in the very early stage of their growth, the first picking of leaves maturing after treatment should be discarded owing to the presence of DDT residues. Cauliflowers must not be treated with this insecticide after the curd commences to form.

Plants such as pumpkins, melons or other related vine crops, should not be treated with DDT as they are susceptible to injury by this chemical.

Pyrethrum powder mixed just before use with an equal quantity of 2½ per cent. nicotine dust, applied liberally with a dust gun, is effective for treating this pest. This treatment is best undertaken while the bugs are in their immature stages. The surface of the soil around the plants should also be dusted in order to treat any bugs which may have dropped to the ground.

RED-LEGGED EARTH MITES (*Acarina*).

RED-LEGGED earth mites are mainly winter pests. Their eggs hatch with the beginning of cold weather, but only under suitable moisture conditions, and it is following the first autumn rains that the mites become sufficiently numerous to cause appreciable injury. Little development takes place during the summer.

Two species of these mites occur as pests in New South Wales. The most prevalent and widespread species, *Penthaleus major,* occurs over a large portion of the State. The districts which appear to be most favourable for its development are the Upper Hunter and North-west Slopes. The other species, *Halotydeus destructor,* is confined to the southern sections of the State.

Their preferred cultivated food-plants are lettuce, peas, lucerne and Subterranean clover. Turnips, rape, spinach or silver beet, beetroot, etc., and various ornamental flowers such as calendula, chrysanthemum, snapdragon and stock are also infested. The pasture weeds most frequently attacked are shepherd's purse, variegated thistle, prickly lettuce and nettle-weed.

The mites, by feeding on the plants cause blemishes on the leaves, which typically appear as silvery or greyish areas, usually along the main veins. When the plants are heavily infested the whole leaf surface may be damaged and present a bleached appearance. Seedlings, particularly of lucerne,

may be killed outright and the injury is often mistaken for frost damage. Pronounced damage of this kind, however, is usually confined to late-sown crops which germinate and commence growth under conditions which are too cold to allow them to outgrow the mite injury.

The adult of the most prevalent species, *Penthaleus major,* measures about 1/25 inch in length. It has a purplish-blue body, and on its upper surface there is an oval reddish patch. The legs and mouth-parts are bright red.

The eggs of this mite are laid singly on the leaves, or on the soil, or amongst rubbish. They are wrinkled and vary in colour from salmon to whitish-yellow, and hatch with the beginning of cold weather, under suitable moisture conditions.

During the day these mites may be found clustering together in the centres of the infested plants, or on the surface of the soil under the plants. The majority of the mites feed during the early morning or towards sunset.

The other species of mite, *Halotydeus destructor,* which is more active, has a velvety-black body and red legs, and does not possess the reddish patch on its back. It lays its eggs in masses, in a single layer, mainly on the undersides of the leaves of the plants, and mostly where they come into contact with or close to the soil. The egg-surface is smooth and glossy when moist, but may have a whitish bloom when dry. It is bright yellow or orange in colour. These mites are to be found in groups when feeding.

Control.

Where vegetable and flower crops are attacked, these mites may be controlled with a white oil and nicotine spray diluted in the following proportions:—

White oil emulsion—6 fluid oz.
Nicotine sulphate—1 fluid oz.
Water—4 gallons.

A dust which has also been found effective in controlling these mites consists of the following:—

Nicotine dust (5 per cent.)—1 lb.
Tobacco dust (superfine)—1 lb.

Treatments with sprays or dusts containing nicotine should be carried out during the warmest period of the day, and a reasonably warm, fine day should be selected for the operation. It is essential to spray or dust the soil below the plants as well as the plants themselves.

Leaf Showing Characteristic Damage Caused by Red-legged Earth Mites.

[*After Swan.*

Under field conditions, the following dust mixture has been found very effective in controlling these mites:—

Carbolic powder—1 lb.
Hydrated lime—4 lb.

This dust is of value for the treatment of infested ground before sowing a crop, and the most effective time for application would be about two or three weeks after the beginning of the autumn rains.

In recent experiments, DDT, applied at the rate of 30 lb. of 2 per cent. DDT dust, or 13 to 15 lb. of a 5 per cent. dust per acre, has been found effective in controlling these mites. In treating fields the dust may be mixed with superphosphate and applied with a drill as a top-dressing, care being taken to ensure that the dust falls evenly over the surface of the soil.

For market gardens, the 2 per cent. dust may be applied, either alone or mixed with superphosphate, by means of hand-dusting equipment, care being taken to cover the surface evenly.

Home gardens may either be dusted with a 2 per cent. DDT dust or sprayed with a DDT emulsion using 2 fluid oz. of 20 per cent. DDT emulsion to 2½ gallons of water.

Where any area is to be treated, attention should also be given to surrounding grass or weeds as these may be sources of further infestation.

(*Continued on page 100*).

The Farmer's Library

Reviews of Books of Interest to Farmer and Student.

Rural Life in Process.

BY PAUL H. LANDIS.

THE 1948 (second) edition of "Rural Life in Process" by Paul H. Landis,—first published 1940—is an imposing addition to an already imposing list of McGraw Hill publications on sociology.

The author is Chairman, Division of Rural Sociology, Professor of Sociology, The State College of Washington, U.S.A.

The thirty-two chapters (538 pp.) studded with data, thoughts, interpretations and conclusions with roots deep in sociological research, are followed by a name index seven pages and subject index sixteen pages. Sociology students and researches will be excited also by the comprehensive bibliography of "collateral reading" appended to each chapter.

The appendix "Development of Rural Sociology in the United States"—in itself a challenging stimulant to other nations' interest in rural sociological research, teaching and extension work—dates 1907, when Theodore Roosevelt appointed a Country Life Commission, as the beginning of a widespread interest in rural life problems in the United States. Suffice to say that only a society which so early pronounced a research attitude to rural sociological problems and trends might hope to produce a text such as Landis' "Rural Life in Process."

"Rural Life in Process" is for the greater part in sufficiently homely language to reward also the attention of a wide reading public. Rural people in particular would be intensely interested in this study of their "opposite numbers" in the United States.

Our copy from the publishers.

[*Review by H. Parry Brown.*

Farm Soils—Their Management and Fertilization.

BY EDMUND L. WORTHEN.

This book is primarily designed as a guide to farming practice in so far as the management and treatment of the soil is concerned and is recommended by the author and editors as a guide to farmers. It is mostly generalised and conventional in this regard, and the fourth edition published 1948 brings up-to-date elementary farm practice in the conservation of the soil. It comprises 508 pages, divided into thirteen chapters and index. The author is Professor Emeritus of Soil Technology, Cornell University, U.S.A.

The first part of each chapter is designed as a guide to farmers in the procedure of soil treatment for crop production. Being for the most part written for American conditions it is not greatly applicable to Australian farming practice, although of course the same general principles are common to both.

The second part of each chapter is described as general information of interest largely to students, and which may also be of value to, although not essential to farmers

in the efficient production of crops. This part of the book is certainly put together in a way which makes the book good reading for students. It should also appeal to farmers who are of an inquiring turn of mind and who desire more information as to why they should adopt certain practices.

Our copy from the publishers—John Wiley and Sons, New York, U.S.A.

[*Review by H. Wenholz.*

"Field Crop Abstracts."

THIS new abstracting journal has appeared as a result of a recommendation of the 1946 Review Conference of the Commonwealth Agricultural Bureaux, whereby the information centre formerly known as the Commonwealth Bureau of Pastures and Forage Crops became the Commonwealth Bureau of Pastures and Field Crops.

For the first time, abstracts of world literature on the cultivation and agricultural botany of all field crops which are grown in rotation are brought together under one cover. General sections on such subjects as land utilization and management, farming systems, machinery and equipment and the field control of weeds, diseases and pests, are followed by sections on cereals, legumes, oil and fibre crops, and root crops. Further sections deal with crop botany, physiology and biochemistry, environmental studies, taxonomy, and book reviews. In those sections of the journal containing abstracts on specific crops, each crop is dealt with under headings such as agronomy, crop geography, economics of production, adaptation and variety trials, etc.

The journal has six issues per year, appearing in January, March, May, July, September and November, the first five containing author indexes, and the sixth being in the form of a comprehensive index, containing author, subject, crop and geographic indexes.

This journal may be ordered from C.A.B. Central Sales Branch, Penglais, Aberystwyth, Wales. Annual subscription 35s. sterling, less 20 per cent. for orders placed direct.

Australian Journal of Scientific Research.

THE Council for Scientific and Industrial Research, in collaboration with the Australian National Research Council, has established in Australia a new scientific journal, the *Australian Journal of Scientific Research*, as a medium for the publication of research papers of outstanding merit. This journal is open to receive contributions from research workers, irrespective of country or of the organisation to which they are attached.

Dr. N. S. Noble has been appointed as Editor of the new journal. Editorial policy is determined by an Editorial Board under the chairmanship of the Editor and comprising as members: Professor W. J. Dakin (Department of Zoology, University of Sydney), Professor E. J. Hartung (Department of Chemistry, University of Melbourne), Professor L. H. Martin (Department of Physics, University of Melbourne), and Professor J. G. Wood (Department of Botany, University of Adelaide). In order to maintain the journal at a high standard a strict refereeing system has been instituted.

The journal is printed in two series: Series A (Physical Sciences) and Series B (Biological Sciences). Each series is issued quarterly, the subscription being 30s. per annum. The first two numbers of each series have been issued, and inquiries and orders for the new journal should be addressed to the Secretary, C.S.I.R., 314 Albert-street, East Melbourne.

Insect Pests—*continued from page* 98.

The warnings given in the preceding note on the green vegetable bug, concerning the use of DDT on various plants which may become coated with undesirable residues, also apply where this insecticide is used to control red-legged earth mites.

Extract from Sydney Press,
5th Jan., 1949.

SYDNEY, WEDNESDAY, JANUARY 5, 1949.

RABBITS DEVASTATE PASTURE LAND THROUGHOUT AUSTRALIA

Plague Is Worst Yet

REPORTS of damage caused by rabbits throughout Australia reveal that the nation is suffering what is probably the worst rabbit plague in its history. In Victoria the rabbits are actually attacking the wheat crops. Farmers estimate that thousands of bags of wheat have already been lost.

THE rabbits have made serious inroads on crops in the central Mallee wheat belt and farmers are now racing to bring in their harvests before the pests cause further damage.

A spokesman for the Farmers' and Settlers' Association said today that the rabbit menace had reached the proportions of national problem.

carcases were big dollar earners.

He said the menace could be effectively fought if sufficient materials were available.

At present, he said, fumigants and poisons were hard to obtain, as wool lines were imported, and wire netting used to isolate rabbit-free country was also scarce.

An official

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is the answer to this vital problem

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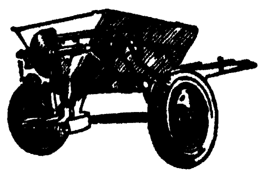
FAN TYPE BROADCASTERS

Horse drawn or trailer types or steel or pneumatic wheels, and models for erection on motor truck or farm waggon. Adjustable spread from 10 to 30 feet. Featuring famous Crump chain feed and friction disc drive. No cogs or stars, no choking or delays.



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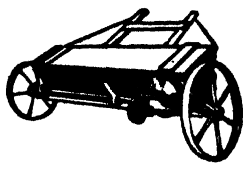
Widths of up to 17 feet on steel or pneumatic tyre wheels for horse draught or truck haulage. All sizes in "speed" models for motor truck attachment. Famous Crump chain feed. No cogs or stars. Slow moving parts. Special types for orchardists and market gardeners.
Crump top-dressing machines sow grain with or without fertilizer, and grass seed with fertilizer, evenly, quickly and economically.



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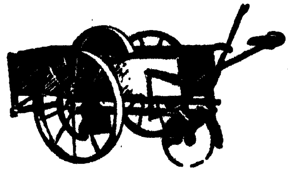

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TUBER TRANSMISSION OF THE SPOTTED WILT DISEASE OF POTATOES.

R. J. CONROY, B.Sc.Agr., Assistant Plant Pathologist; N. S. SHIRLOW, B.Sc.Agr., Agronomist; R. D. WILSON, M.Sc., M.Sc.,Agr., Plant Pathologist; and E. J. WARING, B.Sc.Agr., Agronomist.

TRIALS conducted at Hawkesbury Agricultural College in 1947 to secure further information on the importance of the carry-over of spotted wilt infection in potato tubers, indicated that there was a low percentage of transmission.

As a result, for the 1947-48 season, a spotted wilt tolerance of 5 per cent. (at either first or second inspection) was allowed separately from the tolerance for all other diseases combined, which remained unaltered.

The spotted wilt disease of potatoes, caused by the same virus as that which is responsible for the spotted wilt or bronze wilt disease of tomatoes, was first recorded in New South Wales on potato by Magee[2] in 1935. It is probable, however, that the disease was present on potatoes in this country many years earlier, since it has been recognised as a disease of tomatoes in New South Wales since 1920[3] and in Victoria since 1915.[1]

Spotted wilt occurs in practically all potato crops in coastal areas during the spring and summer. It also usually occurs in every section of the main potato growing areas on the Central and Southern Tablelands of New South Wales, but has not yet been of any consequence in any of the potato growing areas on the Northern Tablelands.

Economic Importance of the Disease.

The incidence of the disease varies considerably from season to season. It is usually more prevalent in dry seasons than in wet seasons and this is thought to be due to the fact that dry weather favours the thrips which carry the disease from affected to healthy plants. In the dry 1946-47 season, for example, as indicated in an earlier issue of this Gazette,[4] spotted wilt was present in many of the potato crops on the Southern and Central Tablelands of the State, infections of the order of 100 per cent. being recorded in some cases.

In the previous season (1945-46) which was also a dry season, but not as dry as 1946-47, the disease was not so widespread or severe but it did occur in many tableland potato crops, especially in the Bannister section of the Southern Tablelands.

During 1947-48, which was a much wetter season than normal for the tablelands, spotted wilt was observed in a number of crops but the infection was generally light, in spite of the fact that many of the crops were grown from tubers harvested from crops in which spotted wilt was present.

In the case of tableland crops, there have almost certainly been yield reductions because of this disease and in some cases they appear to have been serious. In addition to its effect on yield, the disease has been of importance because its presence in many otherwise excellent potato crops has resulted in the rejection of such crops as sources of

Leaves of a Potato Plant affected with Spotted Wilt. Showing rings and necrotic spots.

certified seed potatoes. This was particularly the case in the 1946-47 season when, out of 541 acres submitted for certification in the Orange-Milthorpe-Blayney district, 523 acres were rejected because of the presence of this disease.

Previous Investigations.

Investigations by Norris and Bald[4] at Canberra and by Magee* showed that even when tubers from plants severely affected with spotted wilt were planted, only a proportion of the resulting plants were affected with the disease. Norris and Bald,[4] for example, found that when tubers showing the characteristic distortion and cracking which had been found to be associated with spotted wilt affected plants, were planted, about one-third of the resulting plants showed symptoms of spotted wilt whilst the remaining two-thirds were healthy.

The Seed Certification Scheme Tolerance.

It was thought that the tolerance permitted for spotted wilt in the New South Wales certification scheme (3 per cent. for this and other diseases combined, at the final inspection) was possibly too severe, and that it might be in the interests of potato growers and the certification scheme generally to have a somewhat higher tolerance for spotted wilt in crops submitted for certification, and thus secure a greater volume of certified seed. The position at the end of the 1946-47 season was that a large quantity of seed tubers, which were of a very high standard in reference to varietal purity and freedom from diseases such as leaf roll and mosaic, were not certified, and coastal growers had no means of distinguishing between such non-certified seed and other lines of seed tubers which might be severely affected with leaf roll and mosaic.

Experiment at Hawkesbury College, 1947.

With a view to securing further information on the importance of carry-over in the tubers, an experiment was carried out at Hawkesbury Agricultural College in the latter part of 1947.

Two plots of about 500 tubers each (10 rows each 22 yards long) were planted late in July with tubers from a certified crop apparently free from spotted wilt; and three plots of about the same size were planted with tubers harvested from two crops in which 100 per cent. of the plants showed symptoms of spotted wilt. The variety was Factor (Up-to-date). The plots were separated from each other by distances ranging from 55 to 85 yards.

Counts of the number of spotted wilt affected plants were made at approximately weekly intervals from 30th September to 4th December, and the results of these counts are summarised in Table 1. Spotted wilt affected plants were marked with a stake but were not removed.

TABLE 1.—PERCENTAGE OF SPOTTED WILT AFFECTED PLANTS.

Date of Inspection.	Plots from spotted wilt affected crop.	Plots from healthy certified crop.
30th September ...	1·16	0·00
8th October	1·51	0·00
15th ,, ...	2·21	0·11
22nd ,, ...	2·58	0·31
29th ,, ...	3·50	0·80
5th November ...	6·35	1·29
12th ,, ...	9·11	2·10
19th ,, ...	9·70	3·95
26th ,, ...	13·10	6·20
4th December ...	16·27	7·38

About the middle of December a severe outbreak of late blight (*Phytophthora infestans*) rendered further recording of spotted wilt symptoms impossible.

The tubers were dug in January, 1948, and, though exact yield figures were not kept, it was estimated that yields from the staked, spotted wilt affected plants were only about a quarter of those of the plants which had not shown symptoms of spotted wilt.

Discussion.

The earlier appearance of spotted wilt in the plots grown from tubers from spotted wilt affected plants, together with the higher percentage of infection in these plots, in comparison with the plots grown from certified seed, indicate that there was some transmission in the tubers. It is not possible, however, to determine with certainty how much of the spotted wilt observed was primary infection from the seed tubers, and how much secondary infection coming as a result of transfer by thrips from earlier infected potatoes in these plots or from other crops or weeds in the vicinity.

In this respect, Norris and Bald[4] state: "It is apparent that plants arising from infected tubers in the field may survive long enough for thrips larvae to acquire the virus,

* Magee, C. J., unpublished experiments.

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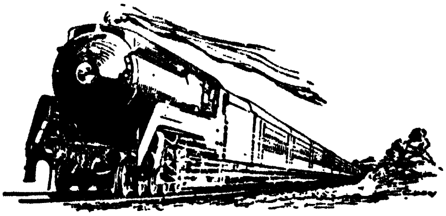

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pupate and emerge as infective adults capable of transmitting the virus to healthy potatoes. Such plants are thus a likely source of infection wherever spotted wilt occurs in potato crops. However, since a generation of thrips must develop on diseased plants before current-season transmission can occur, new infections arising from these *internal* sources will not appear while the potato crop is in the early stages of growth, probably not for six or eight weeks after emergence. Symptoms of infection from *external* sources might occur any time from about two weeks after emergence, this two weeks being approximately the incubation period of the virus in the plant."

It is considered that, on present knowledge, most of the new infections recorded in the Hawkesbury College plots in November and at least part of those recorded in October, could be attributed to secondary infection, and that the primary infection, in the case of the plants from tubers from spotted wilt affected crops, would be between 3 and 5 per cent. The fact that, by 4th December, 7.38 per cent. of spotted wilt had been recorded in the plants from tubers from a crop apparently free from this disease, indicated that some secondary infection was occurring, and it would be expected that the amount of this secondary infection would be greater in the case of the potato plots grown from tubers from spotted wilt affected plants where there were additional sources of diseased material.

It is evident, however, that whatever the exact percentage of carry-over may have been, the figure was not high. Much, of course, would probably depend on the stage at which the crop from which the seed tubers were harvested became infected with spotted wilt. In the case of a plant infected late in its life, very little if any of the virus might find its way into the tubers, whilst where a plant was infected earlier, the virus would more likely reach the tubers.

The very much lower yields from spotted wilt affected plants indicate that spotted wilt does have a serious effect on yield and that the disease may at times be a serious factor in potato production.

Application of the Results to the Potato Certification Scheme.

The apparently low percentage of tuber transmission suggested that perhaps a higher tolerance for spotted wilt in certification might be permissible and, for the 1947-48 season, a spotted wilt tolerance of 5 per cent. (at either first or second inspection) was allowed separately from the tolerance for all other diseases, combined, which remained at 5 per cent. for the first inspection and 3 per cent. for the final inspection.

Trace infection with spotted wilt in any line of seed potatoes may, at times, be of some importance in initiating an outbreak of the disease and, in spite of the fact that a higher tolerance is permitted for the disease in certification, growers who produce seed tubers should endeavour to rogue either all their seed crops or at least a selected stud plot very thoroughly for this disease.

Summary.

In a field experiment conducted at Hawkesbury Agricultural College in 1947, evidence, additional to that secured by other investigators, was obtained that spotted wilt is carried over in the seed tubers but that, even when tubers from crops showing 100 per cent. infection were planted, only a small percentage of the resulting plants produced symptoms of the disease as a result of infection from the tubers. Plants affected with spotted wilt yielded considerably less than healthy plants.

Acknowledgments.

The writers desire to acknowledge assistance rendered by Messrs. A. C. Orman, R. C. Madsen and W. D. Hardy in procuring the seed tubers used in the experiment.

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POULTRY NOTES

Points on—

EARLY AUTUMN MANAGEMENT.

V. H. BRANN, Livestock Officer (Poultry).

DURING the past three months thousands of laying hens have been sold, and the majority of them have been slaughtered for export. The reasons given for this wholesale selling of laying flocks seem formidable enough, but they are only sound to a minor degree.

They are:—

1. That attractive prices were offering for them.
2. They were over two years old.
3. There was a decline in production.
4. The high cost of foodstuffs did not justify keeping them any longer.
5. It was necessary to make room for the younger stock.

Poultry farmers should also have considered that:—

A high proportion of these hens would have continued laying satisfactorily well into the autumn, and with judicious culling would have averaged about five to six dozen eggs per bird before the seasonal moult.

They would have provided nearly half the revenue from eggs obtained on the average poultry farm during the summer months.

The present values for hens should continue with no marked charge because of the strong export demand.

Any decline in prices due to the market being oversupplied, could only exist for a very short duration and probably only a few weeks.

It is a costly procedure to keep hens through a moulting season, but the time to sell hens is when they cease production—not while they are in good laying condition.

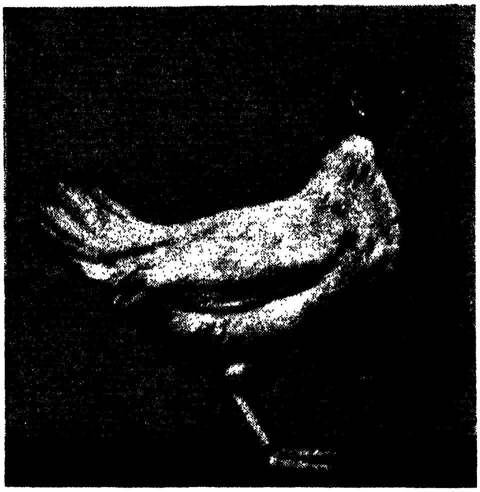
Disposal of Second-season Hens.

It is a sound rule that the average hen has passed her profitable life after the completion of two laying seasons. There is, however, much misconception regarding the right time that this older stock should be culled. After a fowl has completed its pullet year there is only a small margin of difference in the production compared with

older stock. Thus at this time of the year it is common to see second-year hens laying as well as the first-year hens.

The expected decline in production after October, occurs not so much because all members of the flock lay fewer eggs, but because of the presence of culls* that lay no eggs at all. If these hens are removed from the flocks as soon as they cease laying, it is a simple matter to maintain a production of at least 40 per cent. production right up to March and until most of the old stock have been sold.

Unfortunately, it is not possible to detect, from laying hens, those which will stop in the near future or those which may continue to lay far into the autumn. However, at this time of the year a hen which is capable of long-sustained laying is vigorous and active in appearance. Although the best layers are comparatively heavy there is no excess fat, and neither has there been much loss in body weight during the whole of the laying season.



Hens Capable of Laying Over a Long Season.

Note robust condition and dry worn feathering. The photographs were taken during February.

This is characteristic of a strong constitution and applies to smaller hens as well as those with larger frames. Dry, worn and ragged feathering and a bald head are indicative of good laying throughout the season.

Laying flocks kept in condition by good general management and constant culling will show a good return. The high cost of production is fully appreciated, but the greatest difficulties occur where there are insufficient layers to help pay for the cost of growing the pullets to a profitable age.

Housing Conditions for Layers.

Where semi-intensive houses are provided for layers, it is a good plan to confine the hens to the houses during the autumn months. Where culling has been practised throughout the season, there would be sufficient room to keep most of the laying stock under intensive conditions. This system has that advantage that it hastens the course of the moult; also enables the yards to be spelled.

On many farms the system of management of semi-intensive houses is not sufficiently satisfactory to enable the layers to be kept confined to the houses. In fact, what are called semi-intensive houses are often nothing more than shelter sheds, and no provision is made to allow intensive methods to be adopted.

As the name implies, semi-intensive houses should enable the birds to be confined to the sheds at any time it is desired not to use the yards.

In the first place the house must be dry with a floor impervious to moisture and

* Culling was dealt with in November, 1948, "Poultry Notes."

higher than the outside ground level. A liberal supply of scratching litter should be supplied so that the manure will dry out quickly and not become damp. This aspect is important, both for the health of the birds and for the production of clean eggs.

Later, when most of the second-season hens have been culled, fresh yards would be available, into which to transfer the pullets from the range to the laying quarters.

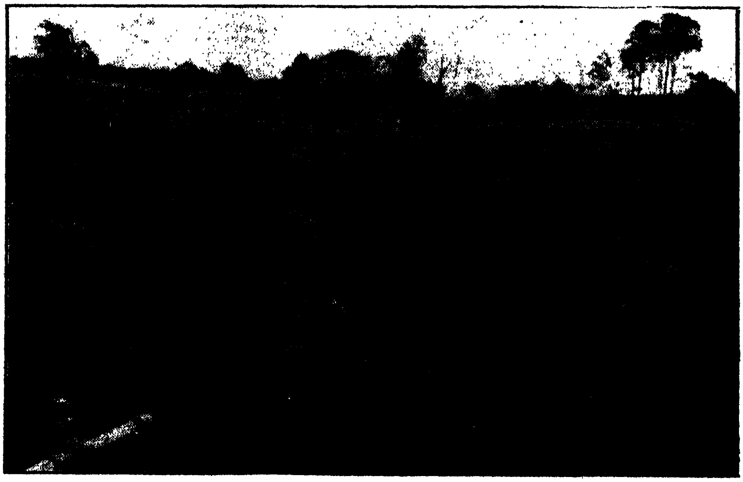
As far as is practicable, the changing of laying quarters for laying stock should be avoided. Moulting hens derive some benefit from a change of quarters and especially if transferred to intensive houses. However, at this time of the year the moving of laying hens cannot be accomplished without loss of egg production.

Regrassing Bare Runs.

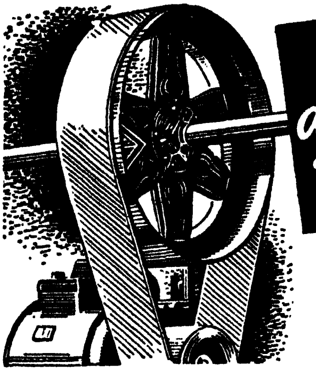
If it is decided to confine layers to semi-intensive houses during the autumn, the opportunity should be taken to re-grass at least some of the yards, which in many cases have grown nothing for years.

Immediately these yards are spelled, a large crop of useless weeds will soon cover the ground unless suitable grasses are planted. A good plan is to make a few of the yards available each year for re-grassing—and this is a decided advantage for the young stock when transferred to the laying houses. Re-grassing also

Left:
Italian Rye Grass and Red Clover 3½ Months After Sowing.



Right:
Perennial Rye grass and White Clover Sown at the Same Time.



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prevents fluid and water erosion of soil which frequently occurs on slopes.

Two mixtures of pasture grasses suggested by the Principal Agronomist (Pastures) of the Department are:—

1. Italian rye 12 lb., Red clover 3 lb. per acre.

2. Perennial rye 12 lb., White clover 3 lb. per acre.

No. 1 mixture should provide a covering to last for eighteen months to two years, provided the runs are not overcrowded.

No. 2 mixture is more suitable for better-class soils, and would be more permanent. These mixtures should be sown during March by just lightly stirring up the surface of the ground, but not by ploughing. In good seasons pastures will become established by the winter.

It should be understood that constant cultivation of fowl yards is not advocated and in planting the grasses the even surface of the yards should not be disturbed any more than is necessary.

As an alternative to these mixtures, Kikuyu grass which has to be planted from roots, may be used. This grass is most prolific and spreads rapidly by means of runners.

In some localities where fowls are run on rocky and poor sandstone soils, Kikuyu grass provides adequate greenstuff for the flocks. It is affected by frosts and is most difficult to establish in runs which are continuously stocked. This grass would be suitable for pastures where cockerels are being raised as the runs would receive periodic spelling.

Lawn Grasses for Green Feed.

The laying down of lawns to provide green feed for fowls is becoming increasingly popular. The adoption of this system of growing greenstuff has these advantages:—

1. The extensive lawns, particularly if in close proximity to the homestead, beautify the property.

2. The grasses are cut when in a very succulent stage, and have a high vitamin content.

3. The grass, after mowing, is ready for feeding either direct to the birds or mixed in the mash.

The disadvantages are:—

1. It takes more time than from green feed plots to cut sufficient greenstuff regularly for the birds.

2. The maintenance of lawns in a condition to provide sufficient good quality greenstuff would be more difficult than the growing of suitable crops such as lucerne, millet and clovers.

Probably a combination of the two methods—that is a good lawn as an adjunct to the green feed plots—would be the soundest policy.

A Kikuyu grass lawn would provide green feed for most of the year, while mixture No. 2 mentioned above for re-grassing bare runs would provide greenstuff during the winter months.

Importance of Sheep Classing.

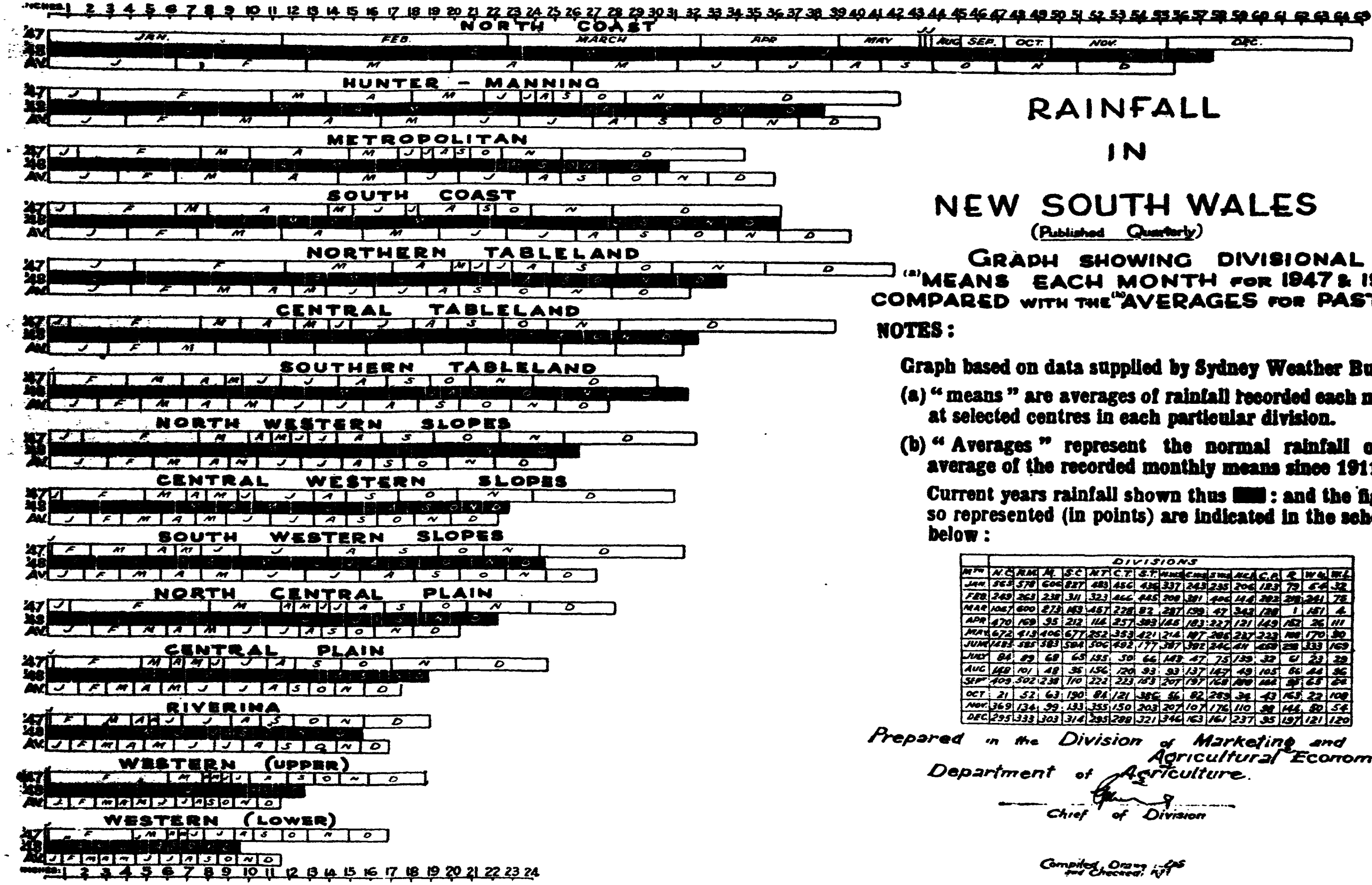
EVERY breeder would be better of if he discarded all sheep of less than average standard in his flock—in many cases the increase in feed available for the balance would give an increase in yield that would more than outweigh that from those culled.

Whatever his breed of sheep, the sheep-owner's aim should be uniformity within the flock, and sheep of uniformly high quality cannot be produced by haphazard methods. In every flock there are sheep with poor conformation, and others lacking breed type, whose fleeces perhaps year after year fail to make the top line and bring pence per lb. less than that of the average sheep.

This is not confined to Merino sheep—crossbred ewes also need classing. There is a vast difference in the profit obtained from the average ewe and the small-framed, poorly-woolled ewe at the tail of the mob. Soundness of udder is also most important in crossbred ewes. Any ewe with hard lumps in teats or udder should be discarded.

Sheep are best classed when between three-quarter and full woolled, although some variation in this practice is necessary with stud ewes so that faults of conformation are not overlooked. Generally speaking, therefore, just before shearing is a particularly suitable time.

Departmental officers are operating in the State's main pastoral districts, and their assistance is available to those requiring it in the classing of the flock and the selection of rams.—J. HOCKLEY, Sheep and Wool Instructor.



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GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1947 & 1948 COMPARED WITH THE (b) AVERAGES FOR PAST YEARS

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "Averages" represent the normal rainfall or an average of the recorded monthly means since 1911.

Current years rainfall shown thus ▬: and the figures so represented (in points) are indicated in the schedule below:

	DIVISIONS														
MTH	N.C.	H.M.	M.	S.C.	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R.	W.U.	W.L.
JAN.	565	578	606	827	483	456	436	337	243	235	206	183	79	64	32
FEB.	249	263	238	311	323	466	445	208	381	406	144	282	298	241	78
MAR	1067	600	273	183	457	228	82	287	199	47	343	128	1	151	4
APR	470	169	95	212	114	257	383	146	183	227	121	149	182	26	111
MAY	672	413	406	677	252	353	421	214	187	285	237	223	188	170	90
JUNE	1485	585	583	584	506	492	177	387	382	246	411	459	258	333	169
JULY	84	89	68	65	155	50	66	143	47	75	139	32	61	23	29
AUG	148	101	48	35	156	120	93	93	137	147	49	105	66	44	36
SEPT	409	502	238	110	222	223	153	207	197	168	180	144	95	65	64
OCT	21	52	63	190	84	121	386	56	82	283	34	43	163	22	108
NOV.	369	134	99	133	355	150	203	207	107	176	110	98	144	90	54
DEC.	295	333	303	314	295	288	321	346	163	161	237	95	197	121	120

Prepared in the Division of Marketing and Agricultural Economics, Department of Agriculture.

Chief of Division

Compiled, Drawn and Checked

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australasian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Berry Training Farm, Berry (A.I.S.)	120	13/11/48
Bradley, H. F., "Nardoo," Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Chegwidden, Est. Late E., "Austral Park," Berry (Jerseys)	94	7/1/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	297	9/6/49
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park" Mumbil (Beef Shorthorns)	74	2/2/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/12/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Riverina Welfare Farm, Yanco	55	6/12/49
Rowlands, F. C., "Werribee," Waugoola	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	27/10/48
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	91	14/10/48
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	10	8/5/48
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/7/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H. Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLachlan, M., "Brodies Plains," Armidale	38	28/9/48
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B. "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Mullholland, E., Armidale	15	10/2/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	16	30/9/48
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
St. Ignatius' College, Riverview	27	14/8/48
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	29	11/6/49
St. Patrick's Orphanage, Armidale	12	8/10/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*					
St. Vincent's Boys' Home, Westmead ...	30	9/7/49	Waddell, W., "Afton," Oakwood Rd., Inverell	127	5 7/49
State Penitentiary, Long Bay	14	27/11/49	Waters, A., Marsh Street, Armidale	2	8/10/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49	Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Tanner, F. S., Dural Rd., Armidale	42	8/10/49	Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49	Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49	William Thompson Masonic School, Baulkham Hills	55	27/4/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49	Williams, L. B., "Birida," Armidale ...	39	12/4/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49	Youth Welfare Association of Australia ...	171	14/4/49
Ursuline Convent, Armidale	5	7/10/48			
Von Frankenberg, F. E. "Spring Hills," Camden	61	7/12/49			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Lettuce Seed Production—Investigations at Leeton Experiment Farm.

A STUDY of factors affecting seed production in lettuce was carried out with a series of sowings last season from late September to late February. Four varieties were seeded direct in the field, namely, Imperial D (winter type), Imperial 44 (summer type), Imperial 615 (winter type) and Imperial 847 (general purpose type).

The trials indicated that the best time for sowing commercial lettuce seed crops in the Murrumbidgee Irrigation Area was late spring. Late November sowings of Imperial 615 and 847 exceeded 350 lb. of good seed per acre. As the plants then fail to form hearts, selection for hearting characteristics is impossible, thus necessitating a "mother seed" production programme.

When sown in early spring, so as to first produce a heart, it is advantageous to slash through the hearts so as to expose the growing point. This allows earlier seedstalk emergence and also limits mortality due to mildew. Lettuce seeded in January and February failed to produce seed.

Side-dressing with sulphate of ammonia had no appreciable effects. Vernalisation (33 to 40 deg. Fahr. for fourteen days) of seed in one trial had little effect.

Germination of Leopard Wood Seed.

SEED of Leopard Wood (*Flindersia maculosa*) a tree of the Western Plains, was tested for the first time in the Seed Testing Laboratory recently. Germination was 70 per cent. in six days. The seed was about nine months old, having been collected at Cobar in January, and held in Dubbo until it was sent to the Laboratory in September. The seed was germinated in a constant temperature of 90 deg. Fahr.

This seed was obtained from an officer of the Forestry Department, who stated that the general impression amongst growers of western trees was that unless seed of Leopard Wood was sown within two months of being collected, it would not germinate.

Further tests are to be made with the seed of this species to determine its longevity.—AMY MYERS, Seeds Officer.

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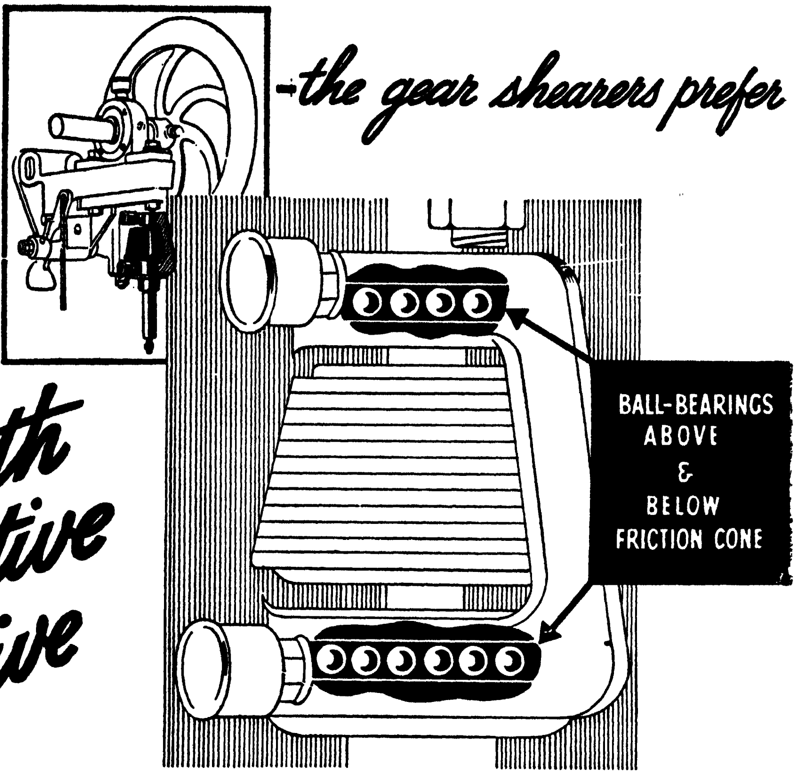

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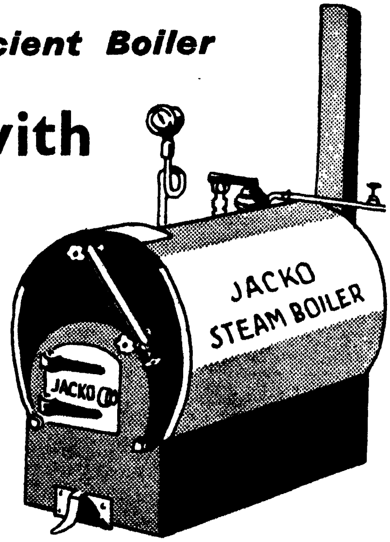

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Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	30
Evans, C. A. & Sons, "Bong Bong," Moss Vale	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121
Hawkesbury, Agricultural College, Richmond (Jerseys)	107
Hicks Bros. "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	49
New England University College, Armidale (Jerseys)	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabee," Quirindi	75
Scott, A. W., "Milong," Young (Aberdeen-Angus)	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	170
Von Nida, F. E., Wildes Meadow	30
Wagga Experiment Farm, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer. A. T., Moorna Pastoral Co., Wentworth	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

Horse-Breeding Act—Suspended Until February, 1950.

THE Horse-breeding Act, 1940, has been suspended for a further period of twelve months, until 1st February, 1950. This has been announced by the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), who said: "Although it was hoped to resume examination of stallions under this Act during the current year, the veterinary staff necessary for this purpose is still not available, and it has become necessary again to suspend the Act for a further period."

Until February, 1947, owners of stallions were required by provisions of the Act to notify the Department of Agriculture in the event of transfer, castration or death of any stallion. The Minister emphasised, however, that *all* provisions of the Act were now suspended, and that, until February, 1950, stallion owners would *not* be required to advise of transfer, etc., of stallions as mentioned above.

Care of the Separator.

THE operation of the separator and the care devoted to its cleansing have a material effect on the quality of cream produced. On no account should the separator be left overnight without being dismantled, and all parts thoroughly cleansed and scalded. After separating, all utensils and separator parts with which milk has come in contact, including the vats, buckets, and strainer, should be washed with slightly warmed water and then submerged in boiling water and placed on racks to drain. The practice of wiping over the utensils with a cloth after scalding only serves to undo the work of sterilisation and to re-infect with bacterial organisms.

Milk should not be left lying about on the floor or under the separator block, and the surroundings should be kept sweet and clean, and the drains free to carry away the floor washings. —DIVISION OF DAIRYING.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Metallic Flavour in Cream.

METALLIC flavour is a very bad defect in cream, but it is definitely within the control of the dairy farmer. It is caused by the action of acid on the untinned patches in cans, buckets, or any of the other metal dairy utensils. Cans should not be scrubbed with abrasive soaps. New cans or buckets, if improperly washed, when first used will impart a metallic taint.

Sometimes well water with a metallic taste, when used to flush the separator, will cause a metallic taint. If cream is allowed to splash about in a partly-filled can during delivery to the factory a metallic taint is possible.

To avoid this fault in cream, all utensils, including separator parts, milking machine pipes, in fact, all metal with which milk or cream comes into contact, must be well tinned and maintained in that condition.

Thoroughly wash all new utensils before they are used for the first time in order to remove the taste of metal. Do not send 2 gallons of cream to the factory in a 10-gallon can if any distance is to be travelled—DIVISION OF DAIRYING.

Canned Bananas—New Queensland Project.

BANANAS are now being canned successfully by a Brisbane cannery, according to a recent report by the Division of Horticulture.

This is the first time this fruit has been canned commercially. The processed article, both whole and sliced, has been favourably commented on by those who have sampled it.

The value of canning bananas lies not so much in having another preserved fruit for the householder, as in being able to stabilise the fresh fruit market by drawing-off and processing surplus quantities when the market is over-supplied.

THE AGRICULTURAL GAZETTE FOR MARCH, 1949

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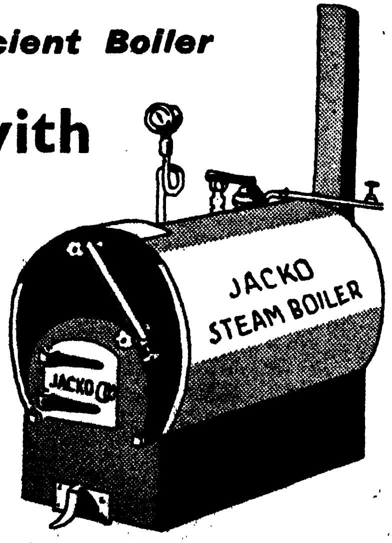

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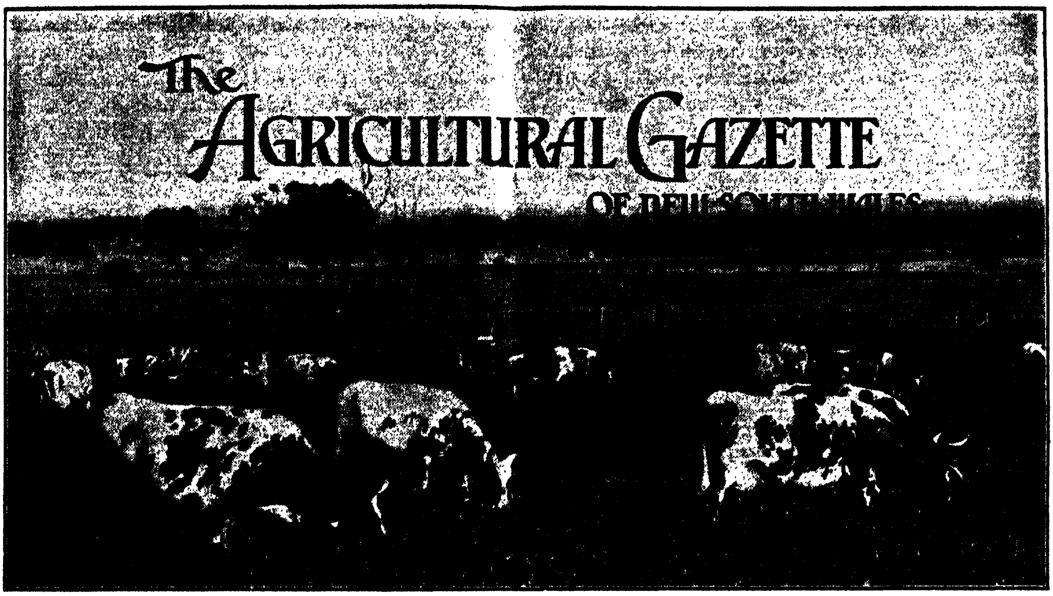


Editorial—

THE DAIRY PRODUCTION COMPETITION.

EACH New South Wales dairy farmer selling milk or cream through a registered dairy produce factory or milk vending establishment is automatically entered for the New South Wales Department of Agriculture Dairy Produce Competition, in which prizes totalling almost £2,000 are offered for increased dairy production.

This is one way in which the dairy production drive announced some months ago by Hon. E. H. Graham, M.L.A., Minister for Agriculture, is being implemented.

Recently the Commonwealth Government decided to make a grant of £250,000 each year for the next five years for the purpose of increasing efficiency and production within the dairying industry throughout Australia. The 1948-49 grant to New South Wales is £54,000 which, wisely used, should go a long way towards obtaining the objective of the drive—increased efficiency and production.

This year's competition closes on 30th June next. For each of seventy-two dairy produce factories in New South Wales, prizes will be awarded as follows:—

First Prize of £10.—To be awarded to the dairy farmer showing the highest percentage increase.

Second Prize of £6.—To be awarded to the dairy farmer showing the second highest percentage increase.

Third Prize of £3.—To be awarded to the dairy farmer showing the third highest percentage increase.

The winner of first prize in each area competition will automatically become a competitor in a district competition. Factories have been grouped into eleven districts and to each district the following prizes have been allotted.

First Prize—£20.
Second Prize—£15.
Third Prize—£10.
Fourth Prize—£5.

To ascertain the percentage increase in production on each farm, the 1948-49 production will be compared with the average of the production for the years 1945-46, 1946-47 and 1947-48. No prize money will be payable unless there is an increase of at least 10 per cent., and where sharefarming operates the prize money will be divided equally between the owner and the sharefarmer.

With the active co-operation of dairy farmers, the competition can do much to encourage improvement in the methods of individual farmers, and the cumulative result in increased production can be of very great value, not only to the industry, but also to the people of Britain.

Further information as to the details of the competition may be obtained from the Department's District Dairy Officers, who are also, of course, available to advise dairy farmers as to the best methods of building up the productivity of their herds and farms.

Short Refresher Courses in Principles of Farm Management For Ex-servicemen.

AT YANCO EXPERIMENT FARM.

SHORT refresher courses in the principles of farm management for ex-servicemen at the Yanco Experiment Farm have been arranged as under:—

No. 9 Course—14th March to 6th May, 1949.
No. 10 Course—16th May to 15th July, 1949.

Ex-servicemen who have been discharged for less than one year who desire to attend a course may apply to:—

The Deputy Director Re-Establishment, Ministry of Post-War Reconstruction, Grace Building, York-street, Sydney.

All ex-servicemen who hold a Qualification Certificate under the War Service Land Settlement Scheme, irrespective of the date of their discharge, are eligible for the course and should apply direct to the Deputy Co-Ordinator Rural Training, N.S.W., Department of Agriculture, G.P.O., Box 36A, Sydney.

The course includes farm management, elementary veterinary science, animal production, and feeding. Specialist groups are formed from students interested in sheep and wool, mixed farming, pig and dairy and horticulture.

Office and Staff Quarters at Yanco Experiment Farm.

Growers of Registered Seed Wheat and Oats.

ARRANGEMENTS have been made by the Department with seventy-nine farmers to sow registered areas of seed wheat, and with fifty-three farmers to sow registered areas of seed oats in 1949. A total of 530 plots will be sown, which are expected to yield approximately 30,000 bushels of high-quality seed.

Under the Registered Seed Wheat and Oats Scheme inaugurated by the Department in 1947, foundation seed of recommended and promising varieties is supplied by the Department to selected farmers who undertake to grow this for production of registered seed.

Registered seed growers are selected by district agronomists of the Department, usually through a farmers' organisation.

AGRICULTURAL BUREAU NEWS

RECENT DIVISIONAL CONFERENCES

Attract Large Attendances.

VALUABLE EDUCATIONAL PROGRAMMES.

LATE summer and early autumn is the time of the year favoured by several Divisions of the Agricultural Bureau for holding the Annual Divisional Conference. Two such Conferences—those of the Monaro-South Coast and the Macquarie Divisions—and also a "Field Day" conducted by the Galston-Arcadia Branch were successfully staged during the month of February, and several others are to take place in March.

Each of these functions attracted several hundred farmers and their wives—both local folk and delegates from throughout the Divisions—evidence that the educational programmes offered were of interest and value to members.

The opportunity was presented at each Conference for delegates to meet the newly-appointed a/Organiser of the Agricultural Bureau—Mr. J. Slater.

"The Field Day" at Arcadia.

At Arcadia, an annual farm machinery demonstration Field Day has been held for some years, and this year's function, held on 15th February, was no less successful than its predecessors. The day was organised by the Galston-Arcadia Branch of the Agricultural Bureau and was attended by approximately 300 people—orchardists and their families and visitors from neighbouring districts.

Throughout the day, farm machines of every type of interest to local agriculturists—ranging from small-type cultivators for market gardens to tractor-drawn ploughs and cultivators and earth scoops, mowers, spray vats and pumps, fruit graders, portable saws, irrigation pumps, etc.—were described and demonstrated. A demonstration of a modern egg-oiling plant in operation was staged by the Egg Marketing Board.

This difficult programme was smoothly presented to time-table and by the aid of a loud speaker the visitors were kept keenly interested. The local branch executive—Messrs. F. Kean, Vice-President (on whose property the function was held), and N. B. Geelan, Hon. Secretary, are to be congratulated on their excellent organisation of the "day," and they were very ably supported by Mr. C. Levitt, District Fruit Instructor, who was compere for the function.

Orchardists Keenly Interested in a Cultivator at work at Arcadia Field Day. [*Photo: J. Martin.*]

The Dalgety Conference.

At Dalgety, where the South Coast and Monaro Division Conference was held on 16th and 17th February, the programme comprised both indoor and outdoor sessions and a special session for womenfolk. The Conference was officially opened by the State General President of the Agricultural Bureau, Mr. J. Somers.

Field sessions were held at "Epaso," the property of Mr. Monckton (where sheep diseases, pasture problems and soil conservation were discussed and demonstrated) and at Mr. W. Preston's market garden—where the culture of vegetables and control of pests were discussed.

Addresses on the programme included those on stock diseases, breeding and feeding of dairy cattle and sheep and wool problems. Mr. Wallace Meares, of Forbes (mixed farmer winner in the recent Rural Bank Progressive Farmer Competition), gave an account of his trip to America and Great Britain, and Mr. C. V. Janes, who is well-known to many Bureau members, addressed a general session.

Hon. E. H. Graham, M.L.A., Minister for Agriculture at Neurea Conference with Mr. J. R. Somers (*left*) State General President and Mr. J. A. Phillipson (*right*) Macquarie Divisional President.

Minister Opens Macquarie Conference.

The Fourth Annual Conference of the Macquarie Division of the Agricultural Bureau was held at Neurea, 12 miles south of Wellington, on the 23rd and 24th February, and was officially opened by the Hon. E. H. Graham, M.L.A., Minister for Agriculture.

The programme presented attracted a record attendance—nearly 200 men and 100 women being present at some sessions. It probably did so because, for the first time, this Divisional Conference was, this year, held in a farming centre and not in a town—and also because in both the general and women's sessions the programme was well-balanced with items of district interest, and included outdoor demonstrations in addition to addresses.

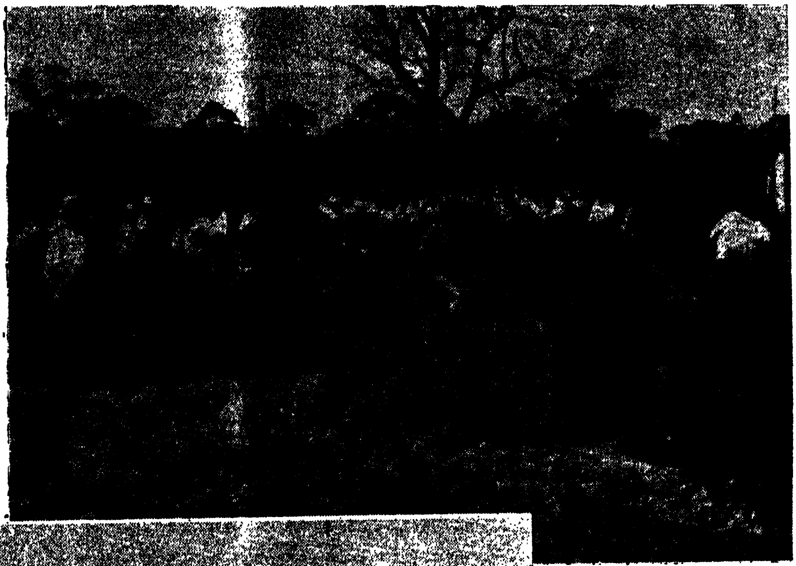
Mr. Graham's Address.

Officially opening the Conference, Hon. E. H. Graham, M.L.A., Minister for Agriculture, paid a tribute to the work of the Agricultural Bureau as an educational organisation aiding the Department in spreading the results of its investigations and its recommendations to primary producers.

The Macquarie Division was suited to the diversification of farming, the development of which was of vital interest to our rural industries, said Mr. Graham. Farmers of the district would be interested in what the Department was doing in regard to both wheat-growing and fat lamb raising.

As to wheat, said Mr. Graham, much was being done to improve both yield and quality as well as disease resistance. It had already been decided to establish a wheat research institute at the Wagga Agricultural College and Experiment Station to investigate all aspects of wheat-growing, and Macquarie Division farmers would be interested in the move to establish an experiment farm at Tamworth and in the extension to be made to Condobolin Experiment Farm.

It was the intention of the Government to extend the grain elevators system until it was capable of handling the greater part of a normal wheat harvest. At present, of



Visitors to the Arcadia Galston Agricultural Bureau Field Day Interested in Machinery Demonstrations.

Ri ht: Cultivation work among young trees.

Left: Several Makes of Tractor-Operated Scoops were Demonstrated to a Large Gathering.

The Falling of a Dead Tree by means of a Portable Saw attracted much attention.

[*Photos:* J Martin.

necessity, this work would be limited to extension to existing silos, and contracts had been let to extend silos at Narromine, Peak Hill and Gilgandra, which were in the Macquarie Division.

As to fat lambs, said Mr. Graham, those who held suitable land should stick to lamb raising, despite the present high prices of wool. The Minister paid a tribute to Australian breeders of longwools. It had been observed by the delegation which he had led overseas some years ago and which had imported a number of high-class sheep, that the Australian standard was gradually approaching that of the Old Country.

The Department had recently sent Mr. J. M. Coleman, of the Division of Animal Industry, to New Zealand to study lamb production in that country, and his services would be available to pass on the information gained to New South Wales farmers. Quality equal to that of New Zealand export lambs could only be attained by killing close to the point of production. The nearest of the proposed country killing centres for Macquarie Division producers would, of course, be Dubbo. Tenders for the construction of portion of these works would shortly be called for.

Programme Items.

Highlights of the programme at Neurea were the addresses by Mr. Pettit, of the Soil Conservation Service (on the contribution by the Service to the solution of the soil erosion problems of the district), by Mr. J. Henry, Veterinary Officer of the Department of Agriculture (on major sheep disease problems), by Dr. C. J. Magee, Biologist of the Department of Agriculture (on hormones and on seed treatment for disease control), and Mr. E. J. Breakwell, of Sydney University (on soil fertility maintenance problems in wheat areas). Particularly useful sessions each day were those devoted to the demonstration of modern farm machinery.

Very valuable sessions for women members of the Bureau were conducted throughout the two days.

An Outdoor Session at the Macquarie Division Agricultural Bureau Conference.
Delegates interested in the demonstration of new types of farm machinery.

Pasture Seed Projects.

THE amount of pasture plant seed harvested during the coming season is likely to be very small. This is due largely to the dry weather during last spring and early summer.

Applications for inspection of *Phalaris tuberosa* seed-production areas have been the greatest on record, but adverse weather conditions have prevented the promised record seed harvest.

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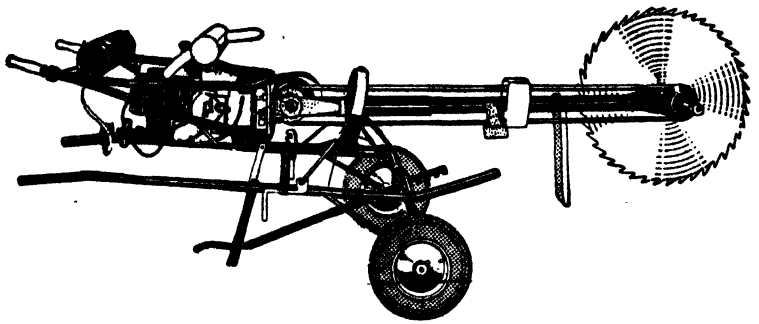

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- FLEXIBILITY OF OPERATION. Angular, vertical or horizontal cuts are easily negotiated. Patent gimbal ring and saddle, and the elimination of crossing V belts, give "Hargan's" additional features of operating efficiency.

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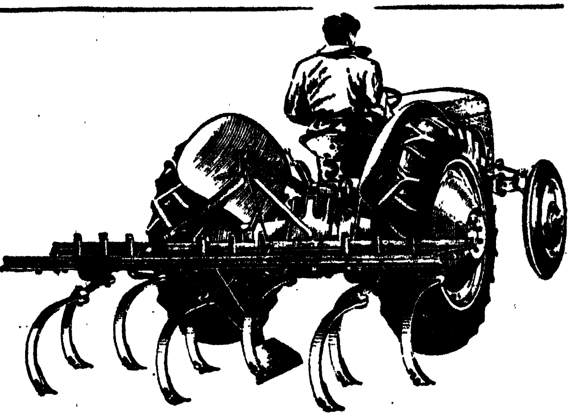

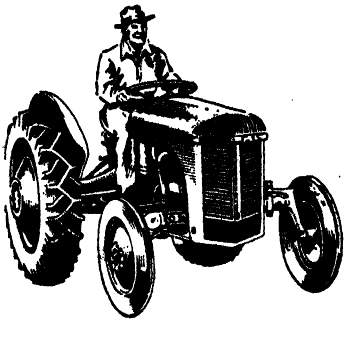

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

PRODUCTION FOR EXPORT

WITHIN a short time of learning of the record income received from our exports of primary products during the year 1947-48, there are indications that receipts for such exports during the current year will be almost equal to, if not greater than, those of last year. The total value of exports for the five months' period, July to November, 1948, amounted to £214,705,000—or just over two and one half times what was received for the whole year 1938-39. Of this, receipts for wool, wheat and flour were £122,910,000 or 57 per cent. of the record total.

Divorced from the internal financial position of Australia, this record export income makes pleasant reading; but it ought not to be considered by itself. Australia's external and internal financial positions are mutually inter-dependent, and in the long run, any development, favourable or otherwise, in the one sector, must make itself felt upon the other sector. Because our primary producers contribute such a large portion to the country's export trade, it follows that they not only receive a share in any benefits deriving from the large income received, but they also feel the effects which that income has upon Australia's internal financial economy. What has been the effect upon the country's economy of this unexpectedly high income?

There has been, since the end of World War II, a progressive, and in some branches of the economy, a rapid expansion of money incomes. This expansion of incomes has not, however, been accompanied by a proportionate increase in the supply of those things on which money incomes can be spent. The high prices we are receiving for our exports, in particular our exports of primary products, have accelerated the expansion of money incomes available for spending. Consequently, there is a gap between the aggregate demand for goods and the aggregate supply of goods. In so far as our record export income continues to rise, and thus to increase the amount of money income available for spending by the community, while at the same time the lack of balance in our industry prevents a proportionate rise in the supply of goods upon which that income can be spent, so far will that increase contribute to a widening of the gap between the demand for and the supply of goods. Any factor which tends to widen this gap can be said to be increasing the general inflationary pressure which threatens the Australian economy.

Post-War Production Trends.

The most important cause of inflationary pressure is that the country's economic system has not yet reached maximum production. The general shortage of labour throughout industry, the lack of raw materials and machinery, the world shortage of dollars, are all at one time or another blamed for our troubles; yet all of these shortages are but symptoms of the fundamental fault. In the present state of world markets and financial exchange, there is only one way to remove the threat of inflation at its root, and that is to increase our production. From this increased production a larger amount can be allocated for export. And no matter how many good reasons are put forward to explain why production cannot be, or will not be, increased, this remains the only way to remove the existing threat to our economy. What have Australia's farmers achieved in the way of production and export since the end of World War II; how do their achievements compare with the last pre-war year?

TABLE I.—PRODUCTION OF CERTAIN FOODSTUFFS AND WOOL (AUSTRALIA).

Item.	Unit of Quantity.	1938–39.	1946–47.	1947–48.
Wheat	'000 bus.	155,369	117,262	233,400
Flour (wheaten) ...	„ cntls.	27,455	29,793	30,444
Sugar (cane) ...	tons	820,086	552,000	608,000
Wool (greasy) ...	'000 lb.	983,582	977,000	1,025,000
Beef	„ lb.	1,252,630	1,092,665	1,256,640
Mutton and lamb ...	„ lb.	717,454	677,907	660,800
Bacon, ham, pork ...	„ lb.	157,408	165,717	156,800
Butter	„ lb.	455,834	321,019	362,880
Cheese	„ lb.	65,646	94,300	91,840
Processed milk ...	„ lb.	72,280	174,897	197,814
Apples, citrus ...	„ cntls.	8,050	7,360	Not available.
Raisins, currants ...	„ lb.	167,462	126,112	181,440
Fruit preserved in liquid	„ lb.	125,966	123,715	138,517

Throughout the world there is still a grave shortage of foodstuffs, and Australia, as one of the main food exporting countries, is under a moral obligation to produce and to export as much food as possible. In Table I a comparison is made between the amount of foodstuffs produced in the year 1938-39 and in the last full year for which figures are available. It will be seen that production of wheat and flour in 1947-48 was greatly in excess of the figures for 1938-39. Because of these increases, the supply of foodstuffs derived from wheat available for export during 1948-49 should be increased considerably. Production during 1947-48 of beef, cheese, processed milk, raisins and currants, and fruit preserved in liquid, were also well above pre-war figures. Of the other items the production of sugar from cane during 1947-48 was lower than the 1938-39 total by 28 per cent. Figures for mutton and lamb, bacon, ham and pork during 1947-48 were also below pre-war totals, but the greatest fall occurred in butter production, which was 90 million pounds less in 1947-48 than in 1938-39.

Although total butter production decreased, the total amount of wholemilk produced increased from 1,141.7 million gallons in 1938-39 to 1,168.1 million gallons in 1947-48. The allocation of wholemilk for cheese production increased from 65.0 million gallons in 1938-39 to 89.2 million gallons in 1947-48, while the amount allocated for other purposes (including domestic consumption) increased from 161.0 million gallons to 241.8 million gallons.

Production of most of these items has increased steadily each year since the end of World War II and, except for mutton and lamb, bacon, ham and pork, and cheese, which showed small decreases, there was a good improvement in production as between 1946-47 and 1947-48. At the beginning of the post World War II period, Australian primary industries were at a disadvantage; the cumulative effect of labour, machinery and raw material shortages was making itself felt, but since then, by dint of hard work and improvements, considerable progress has been made.

Export Since 1938-39.

There is, however, still a great unsatisfied world demand for every kind of foodstuff that we are able to produce, but at the same time most of the importing countries of the world are undergoing acute financial embarrassment. Should the demand for Australia's primary products fall in the near future, it will not be because overseas markets have been satisfied, but because importing countries find themselves unable to pay the high prices asked for our products, or because they have been able to buy more cheaply in other markets.

TABLE II.—EXPORT OF CERTAIN FOODSTUFFS AND WOOL (AUSTRALIA).

Item.	Unit of Quantity.	1938-39.		1946-47.		1947-48.		Five Months, July to November 1948.	
		Amount.	Value. (£A'000).	Amount.	Value. (£A'000).	Amount.	Value. (£A'000).	Amount.	Value. (£A'000).
Wheat	'000 bus.	63,129	8,735	12,176	6,338	60,174	53,037	33,489	28,648
Flour (wheaten)	'000 c'nt'ls.	14,501	4,540	15,302	22,535	15,942	31,823	8,426	18,125
Sugar (cane)	tons	443,014	4,178	117,379	2,820	100,460	3,164	181,698	5,870
Wool (greasy)	'000 lb.	795,728	36,617	1,019,450	96,830	785,548	119,901	346,001	63,501
Wool (scoured tops, noils and waste)	'000 lb.	70,945	5,277	190,996	29,298	165,220	30,331	57,843	12,636
Beef	'000 lb.	271,964	4,323	180,339	4,582	230,504	6,059	139,086	3,965
Mutton and lamb	'000 lb.	186,489	4,807	164,303	4,544	122,676	4,256	16,581	636
Bacon, ham, pork...	'000 lb.	32,455	1,002	25,354	1,422	9,251	746	7,774	561
Tinned meats	'000 lb.	14,896	493	119,713	7,669	94,320	5,931	67,792	3,813
Butter	'000 lb.	229,543	12,892	133,642	12,570	185,122	19,291	63,843	7,918
Cheese	'000 lb.	35,924	1,074	53,662	2,655	51,163	3,275	19,417	1,277
Processed Milk	'000 lb.	19,107	791	105,959	4,234	97,785	4,696	34,543	1,829
Apples and citrus	'000 c'nt'ls.	2,385	1,655	555	1,205	1,682	3,302	486	944
Raisins and currants	'000 lb.	164,211	2,865	91,515	2,157	92,859	2,267	74,965	2,045
Fruit preserved in liquid ...	'000 lb.	81,474	1,413	71,689	2,114	84,689	2,781	64,380	2,248

In Table II a comparison is made between the amount and value of certain exports for 1938-39 and for 1947-48. Figures for the first five months in the year 1948-49 indicate the trend for the current year. Although production of wheat during 1947-48 increased by almost 50 per cent. on 1938-39, the amount exported during that year was 3 million bushels less than during 1938-39. In spite of this small decrease in wheat exports, the value of the amount exported in 1947-48 was more than six times the value of 1938-39 exports. The total value of wheat and flour exports for 1938-39 was only £13,275,000 compared with £46,773,000 for the five-month period ended November, 1948. The price of wheat rose from 2s. 0.98d. per bushel in August, 1939, to 20s. 10d. per bushel in May, 1948, falling to 16s. 2.3d. in October, 1948.

Sugar exports showed the greatest decrease, falling from 443,014 tons in 1938-39 to 100,460 tons in 1947-48. However, during the first five months of 1948-49 sugar exports reached 181,698 tons. Receipts for sugar exports during 1938-39 were £1,692,000 less than the £5,870,000 received for sugar exports during July-November, 1948. Of the other foodstuffs, only tinned meats, cheese, processed milk and fruit preserved in liquid showed in 1947-48 any increase over 1938-39 in amount exported.

Despite the fall between 1938-39 and 1947-48 in amounts exported, revenue from all items except raisins and currants, bacon, ham and pork, and mutton and lamb was substantially higher than during 1938-39. During the first five months of 1948-49, prices of most commodities, and in particular those for wool, have exceeded those received during the previous year, but it is problematical whether these high prices can be maintained throughout the current year.

The fact which emerges is that Australia is now receiving substantially greater income for smaller amounts of exports than she received in 1938-39. There is a danger that the record revenue received from our exports may engender a feeling of satisfaction among our primary producers, but it must be remembered that this income has been received, not from any greatly increased production, but because a hungry world is offering exceptionally high prices for our products.

Importance of Increased Export.

As a member of the Food and Agricultural Organisation of the United Nations, Australia has pledged herself to assist in helping more people to attain a level of consumption at least equal to their pre-war standard. To accomplish this, Australia must be prepared to export a quantity of foodstuffs at least equal to that which she exported in 1938-39.

The Australian farmer, then, is in a position to contribute greatly to the solution of two great problems, the first, a world problem, viz., the global shortage of foodstuffs which necessitates in many countries a low standard of living, and the second, a national problem, viz., the increasing inflationary pressure upon the country's economy. He

can do this by continuing to adopt advanced farming techniques, by reducing his costs and making his farm more efficient, by spending his higher income wisely upon a reduction of his farm debts, or, where it is economically desirable in the purchase of up-to-date machinery, or by building up his savings to insure against any future fall in his income.—H. L. FARRIMOND, Economics Research Officer.

MARKETING FARM PRODUCE.

THE problem of disposing of farm produce at a price that will cover expenses and leave a margin of profit sufficient to make all the work and risk worthwhile, is no less important than those with which the farmer contends in the production of his crops and stock.

Most farmers to-day are alive to the importance of marketing. Market instability in the past, often as damaging as the vagaries of the season, has impressed upon them the need for disposing of their commodities in an orderly fashion. This can be best achieved by co-operation among growers in a given industry to sell their produce collectively through their own organisation. Voluntary co-operation has accomplished much in this direction, but it suffers in two important respects, viz., it may not be fully representative of the industry and may have difficulty in obtaining the co-operation of minority groups in certain essential requirements. However, by an extension of the co-operative principle it is possible to frame an organisation which can command the full support of all the growers and be truly representative.

As a result of a Conference of Producers and Consumers, held in Bathurst in 1926, the Marketing of Primary Products Act was introduced in 1927, which enabled producers to get together and set up boards to control the marketing of their products. The growers of a particular commodity are permitted by this Act to petition the Governor requesting that their product, or any specified grade or variety of it, be declared a "commodity" for the purposes of the Act. The petition must be signed by at least 100 producers of the commodity, or where the number does not exceed 150, by at least 50 per cent. A poll is then taken of the producers concerned to decide whether they desire a marketing board to be formed. If more than half are in favour of a board, it is duly constituted. In this way the will of the majority is put into effect.

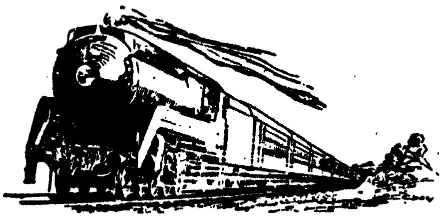
Boards established in pursuance of the Marketing of Primary Products Act are quite distinct from those constituted by special Act of Parliament. The latter may, in fact, give little or no representation to the producers they control. Consultation with the wishes of the industry concerned is the foundation upon which the Marketing of Primary Products Act is raised.

In all, five boards are at present functioning under the Marketing of Primary Products Act in New South Wales, viz., those controlling the marketing of eggs, rice, winegrapes, navy beans and potatoes. Elected producers' representatives are in all of these Boards in the majority. A board may have three, five or seven members, but to guarantee the widest freedom to producers the Act provides that representatives elected by producers shall number two, three and five respectively. The remaining members are nominated by the Government to assist and advise.

The members of a board meet regularly to discuss matters affecting the industry and review the activities of any staff it employs. They are not "agents of the Government"; in fact, the Act specifically provides that the board shall not be regarded as an instrument of the Crown for any purpose whatsoever, nor shall it expend any of its funds for political purposes.

The authority of the board may extend over the whole State or over part of it only. Thus, of the five existing boards, four control marketing for the whole State, while one, the Wines Grapes Marketing Board, is limited in its authority to the Shires of Leeton, Wade and Carrathool, although this area does embrace most of the important regions producing wine grapes.

Once a board has been established all quantities of the declared commodity thenceforth produced become automatically vested in the board, unless specifically exempted



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Special Excursion Tickets, issued by the Department of Railways at single fare for the return journey, are available for travel every week-end between any two stations within the Railway Tourist Area.

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The forward journey may be made on a Friday, Saturday, or a Sunday and the return journey may be made up to the following Monday. When a public holiday falls on a Monday the forward journey may also be made on that day, and the availability of the return portion of the ticket is extended until the following Tuesday.

S. R. NICHOLAS,
Secretary for Railways.

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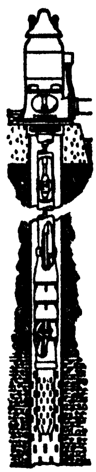

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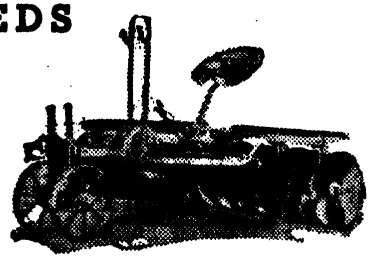
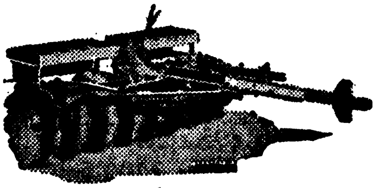


GL-17 Bumper Disc Harrow. Can be supplied with tractor hitch. Tandem attachment also available. Sizes 5, 6 and 7-ft.



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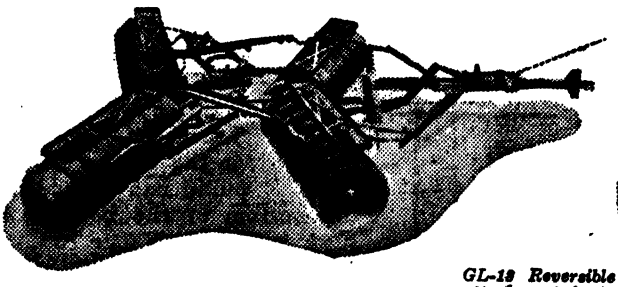

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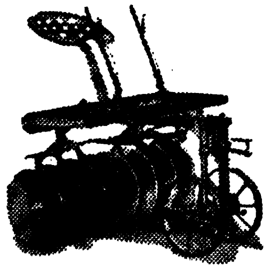

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from control by the board's regulations or license. Conversely, the board cannot refuse to receive products sent to it by growers if they are of the prescribed quality or standard.

A board is a body corporate with all the powers of such. It may enter into contracts, acquire land, erect buildings, sue and be sued in its official name. Furthermore, a board has freedom of action in order that it may dispose of its commodities at the most attractive price possible; for instance, a board is permitted to set up its own selling floors, conduct its own selling arrangements or appoint agents to do so. If the Governor is satisfied that it is in the interests of producers a board may also be empowered to treat the commodity or prepare it by some manufacturing process to gain additional profit.

Arrangements for marketing products may vary considerably as between different boards. In the marekting of wine grapes, for instance, a price is first determined by negotiation between the board and processors and then the growers forward their grapes direct to the wineries. This method has the advantage of minimising marketing costs while securing a guaranteed and uniform return to growers. However, it is often necessary, or desirable, to store produce for some time before selling, or to clean and grade it. When this is the case the board acts as the growers' intermediary. Farmers have only to freight their produce to the board or its agents and wait for their cheques to come in. When there is a considerable lapse of time between the harvest and the final sale the board can arrange to make advances to growers from time to time as finances permit, thereby giving growers the benefit of a regular income which most consider preferable to a lump sum at some indeterminate date.

The sums paid to growers represent the total receipts from sales, less marketing expenses and payment for interest or debt reduction. A board does not operate for the purpose of making a profit, although in the course of time it no doubt would acquire valuable property and equipment which it would hold as a kind of trustee for the entire industry.

Periodically a board is required to give an account of its activities showing details of the business it has transacted during the period. From this financial statement growers are able to judge how efficiently, and at what cost, the board has been handling their affairs.

If they are dissatisfied with a board they may petition, at the end of three years, for its dissolution. A poll of all growers will then determine whether or not the board is to continue. The normal life of a board is three years, at the end of which time, if it still has the confidence of growers, an election is held to appoint a new board for the ensuing term.

Past experience with haphazard marketing has shown the chaos which can result from sudden changes in the demand for and supply of primary products—and the need for orderly marketing arrangements is self-evident. But marketing boards can accomplish more than this; they afford the farmer an opportunity, not only of stabilising his income, but also of participating in an organised effort to improve and expand. A study of market tendencies and consumer preference, coupled with an intimate knowledge of production within its industry, will enable a board to bring demand and supply into greater conformity with one another and thus contribute towards the stability and prosperity of rural industry.—L. C. YORKE, Economics Research Officer.

Hybrid Wheats Tested for Rust Resistance.

SOME 7,000 hybrid wheats developed by the plant-breeding staff of the Department are being tested for rust resistance under glasshouse conditions by the Biological Branch.

These tests will enable many rust-susceptible strains of wheat to be eliminated from the plant-breeding project, and save considerable time and labour associated with field tests.

Throughout the tests, promising selections will be identified for further development by the plant-breeders.

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Blayney (K. Gresser)	March 8, 9
Tumbarumba (Mrs. U. H. O'Shea)	March 8, 9
Cooma	March 9, 10
Blacktown	March 11, 12
Braidwood	March 11, 12
Burrowa	March 11, 12
Cessnock	March 11, 12
Inverell	March 11, 12
Moruya	March 11, 12
Gulgong (T. Amies)	March 12
Dunedoo	March 14
Gundagai (J. C. Saddler)	March 15, 16
Mendooran	March 16
Bombala	March 16, 17
Armidale	March 17, 18 19
Crookwell	March 17, 18 19
Binnaway	March 18
Barraba	March 18, 19
Gloucester (Mrs. M. A. Newton)	March 18, 19
Gresford	March 18, 19
Parramatta	March 18, 19
Baradine	March 22, 23
Warialda	March 22, 23
Delegate	March 23, 24
Taralga	March 24, 25
Wauchope (L. Steel)	March 24, 25
A.C.T.	March 25, 26
Bingara	March 25, 26
Castle Hill	March 25, 26
Dungog	March 25, 26
Manilla	March 25, 26
Muswellbrook	March 29, 30
Tamworth	March 29, 30 31
Camden (G. V. Sidman)	March 31, April 1, 2
Goulburn	March 31, April 1, 2
Quirindi	April 1, 2
Urbenville (S. Stoddart)	April 1, 2
Forbes Gymkhana	April 2
Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Macksville (D. Turner)	April 29, 30
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Grafton (C. C. Pitt)	May 5, 6, 7
Narrabri	**May 6, 7**
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7
Orange (N. J. Aird)	May 5, 6, 7
Condobolin	August 9, 10
Trundle	August 16, 17
Bedgerabong	August 20
Peak Hill	August 26, 27
Parkes	August 29, 30, 31
Grenfell	September 2, 3
Young	September 6, 7
Forbes	September 9, 10
Cowra	September 13, 14
The Rock (O. L. Boyd and A. F. Walker)	September 17
Canowindra	September 20, 21
Eugowra	September 27, 28

Approved Vegetable Seed March, 1949.

CONDITIONS under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Varieties Listed—continued.

Cauliflower—

Shorts—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown—R. C. Morandini, Box 74, P.O., Dubbo.

Crystal Grano—R. C. Morandini, Box 74, P.O., Dubbo.

Early Barletta—R. C. Morandini, Box 74, P.O., Dubbo.

Tomato—

Pearson (Moscow)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day—H. P. Richards, "Sovereignton," Tenterfield.

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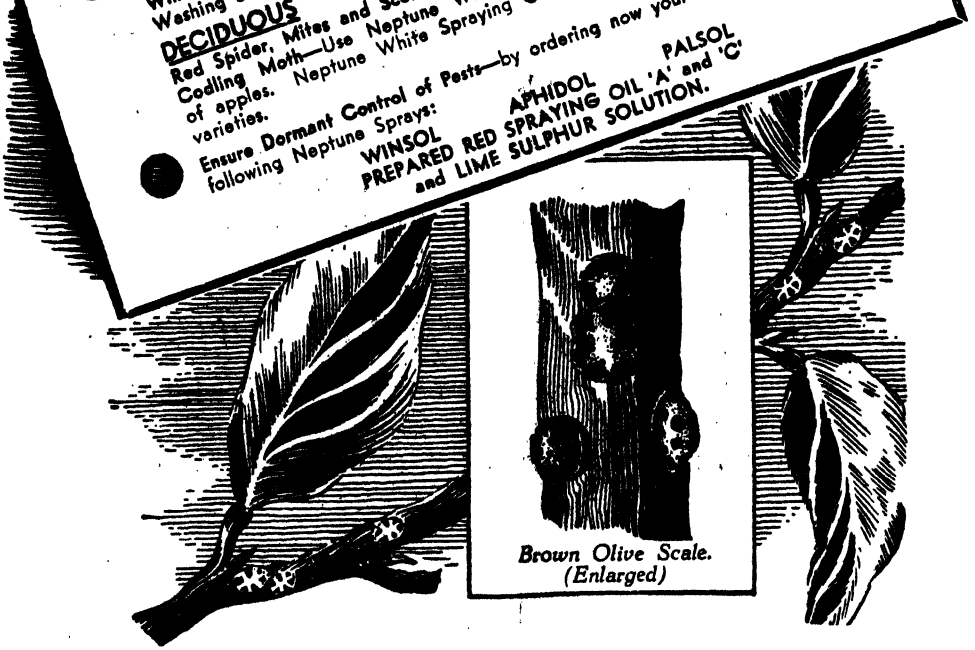

Brown Olive Scale. (Enlarged)

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MECHANICAL MEASURES FOR—

CONTROL OF SOIL EROSION

On Central Coast Citrus Orchards.

K. D. McGILLIVRAY.

WATER disposal is an important aspect of mechanical control of soil erosion. The disposal of large quantities of water must fit into the general planning of the orchard. Over-all planning is, therefore, considered in this article before the details of disposal of water.

Over-all Planning is Essential.

Most citrus properties on the central coast are planted over a number of years. For best results all available knowledge must be utilised in fitting together the year by year jobs of developmental work into an overall plan. Contour planting, therefore, cannot be considered as merely the planting design for isolated plots of trees.

There are many aspects to the planning of a citrus orchard and much more attention should be given to this work. For instance a good scheme of soil erosion control may get in the way of farm work and, therefore, be of doubtful value. There is a great amount of traffic in a citrus orchard; machinery and loaded vehicles move in and out of it and amongst the trees in increasing volume and frequency as the trees grow and production increases. Time and effort can be conserved if the farm is designed for convenience in giving citrus trees the constant attention they need.

The ideal preparation for the establishment of, say 20 acres of citrus orchard over a period of three to four years, on virgin bushland in the Central Coast district, would be to start with a contour plan of the whole area. An inspection of the land would enable the selection of the best site for the first planting, and then, on the plan, waterways, roadways, windbreaks and tree rows could be sketched in, making provision for present and future needs.

Fig. 1.—A Grassed Waterway will Discharge on to this Well-covered Swampy Bushland.
Mr. J. Challis' property at Somersby.

This is an ideal which cannot be put into practice under present conditions, but by using trial by error methods, it is usually possible to formulate a real plan, even if it may not be set out on paper.

The writer knows that the development of an orchard property does not always go ahead smoothly. Unexpected problems, and problems which cannot even be guessed at, do arise, but it is sound practice at least to start with a good practical plan.

The plan is put to work when the first orchard block is set out for planting. Future plantings take their place later as the application of the plan is developed.

principle applies to contour plantings. If roads are far apart, too much time is lost in travelling to them with loads of fruit, spray plants and so on. Experienced citrus growers like their roadways to be spaced twenty to thirty trees apart (400 to 600 feet). Contour planting must, and can, meet this requirement.

The best position for main roadways is at the head of catchment areas away from accumulations of surface run-off. Most of the fruit which goes off and the materials which come on to the property pass one point, usually the farm shed. Roadways are designed to serve this point efficiently. The position of the water supply for spraying may need some thought too.

Fig. 2—A Gully Starting on the Headland of a Young, Square-planted Orchard on the Coastal Highlands.

Positions for Roadways and Waterways.

The length of tree rows largely determines the position of roadways and waterways. This does not imply tampering with the principles of the control of soil erosion, but shows recognition of an important practical item.

A common method of reducing soil erosion on square plantings of citrus trees is to cut the area into small blocks of 2 or 3 acres with drains or sunken roadways between. Contour-planted blocks can be much bigger and the rows much longer. Their size though must be limited to suit orchard traffic and for convenience in orchard operations. Operators of square plantings recognise the invitation to erosion which is offered by wheel tracks up or down the hill on tilled soil; they do their uphill and downhill travelling on roadways. The same

Fixing the position of waterways is another prelude to contour planting and has important effects on farm design. For example, the flooding of roadways and the land around farm buildings can cause great inconvenience. Properly placed waterways, roadways, and buildings can prevent this.

Disposal of water by discharge on to bushland is the first choice, with a preference for stony, swampy or otherwise unusable land (Fig. 1). If waterways have to be constructed their relation to future possible plantings needs some thought. The position of the roadways and waterways needed for, say this year's planting, should not be settled until their effect on later development is reasonably clear.

Fig. 3.—An Effective Diversion Drain above Mr. C. P. Le Mesurier's Orchard at Somersby.

The position of windbreaks and the space to be occupied by them comes into planning before planting. Citrus trees need at least 30 feet spacing from windbreaks. The usual situation for windbreaks is adjacent to roadways, waterways and boundary fences.

Water Disposal.

Water disposal, to the orchardist, means taking away a concentration of water from orchard areas and conveying it safely downhill until it reaches a well-covered, stable, natural watercourse or creek. What may seem to be a "back-to-front" presentation—discussing the problems of water disposal before those of contour planting—is intended to emphasise the importance of the foundation work of water disposal.

Heavy storm rains can be expected on the Central Coast. Large amounts of water will run off the orchard area, even if it is protected by well-designed, graded drainage banks.

At the discharge end of the drainage banks the steady flow along the banks changes to more speedy movement downhill. Each drainage bank adds its quota, until there is a heavy concentration of fast-moving water, running downhill and capable of cutting out a new gully. This damage can be prevented if, with certain precautions, it is discharged on a surface protected with vegetation—well-covered bushland, a stable natural watercourse, or a properly designed and constructed grassed waterway. Run-off occurs on square plantings too, where gullies on headlands are often seen (Fig. 2).

We cannot afford to lose interest when water from drainage banks leaves the cultivated area. Some hastily contour-planted orchard areas have not been properly protected by safe disposal of drained-off water; headlands have been washed out and fresh erosion started. There are opportunities for

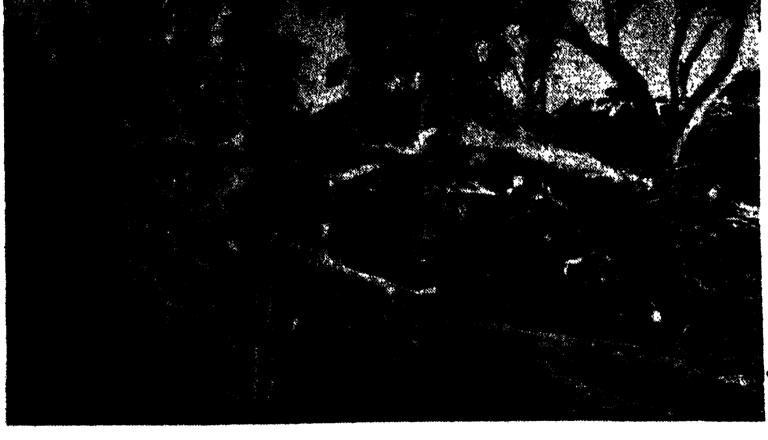

Fig. 4.—Heap of Logs and Soil pushed off by a Bulldozer, showing an Opening cut through for Water Disposal. Mr. J. Challis' property at Somersby.

improved water disposal on square-planted orchards too, waterways taking the place of troublesome drains.

A commonsense principle of run-off control is to start at the top of the slope.

Run-off from Higher Levels Must Not Reach the Orchard.

If water, running off from higher land, could flow into the orchard, the first line of defence is a diversion drain above the orchard. (Fig. 3.) Most coastal citrus growers attend to this drainage, often in bushland, immediately above the orchard. Some erosion has been seen, but bush plants usually take care of the surface of the drain. On some sites these drains could be constructed less laboriously and more economically on the edge of the clearing, the capacity of the drain being increased by moving the soil downhill to form a bank below it. This may seem obvious but is not always done. Grassing the surface protects it against washing out. Many of these drains are across the slope and not on steep grades. The capacity of protective drains above the orchard should provide generously for the run-off likely to reach it from the land above.

Why Destroy the Cover in Natural Watercourses?

Small natural watercourses, well-covered with trees and undergrowth can often enter usefully and cheaply into water disposal schemes. The native trees in them too, can sometimes provide a windbreak. Bulldozers clearing land on the coastal highlands have cleared out some of them and filled some others with logs pushed off from the area to be planted. The fierce fire which follows destroys the cover in the watercourse. The climate does favour rapid regeneration of native plants but some damage has been done. An unstable gully with an easily eroded surface is not suitable for water disposal.

If the clearing ends at a steep slope into a natural watercourse, water disposal is not difficult. A bare cleared watercourse which is eroding can often be protected and used by reforming it into a flat-bottomed, wide, grassed waterway, taking precautions to divert storm-water until the grass is established.

Water Disposal on to Bushland.

Many orchard blocks can be designed to discharge water from banks into the bush on either side. Some care to spread the water may be necessary, and particular care is needed to get it away from the cultivated headland. The graded bank, crossing the headland at its discharge end should be substantial and wide for easy crossing by vehicles and implements which must cross it in moving from row to row.

Clearing methods on headlands have set traps for the unwary. Trees are often pushed off with bulldozers into the bush adjoining headlands; heaps of surface soil are pushed off with them—a deplorable practice. (Fig. 4.) An experience which came to the writer's notice may serve to illustrate a danger. The construction of graded drainage banks and outlets to the bush was proceeding on the first graded bank project on a Central Coast orchard. Before outlets could be completed, 28 inches of rain fell in five days. The heaps of soil and logs stopped water discharged from running into the bush and it concentrated on the headland. The gully which resulted did not discourage interested growers because they recognised the cause.

Water Disposal on Grass Paddocks.

A well-covered grass paddock on the coast is usually a safe disposal area. If the slope is very steep or the cover becomes thinned from any cause it may become unstable. Water can be spread by "staggering" the banks.

Grassed Waterways Take Water Downhill Safely.

A grassed waterway is merely a surface drain for running water downhill but it is a drain with special features. When other methods of disposal previously mentioned are not available it can be confidently recommended. It is successful when it is well-designed, well-constructed and well-grassed. Fortunately all this is simple; few orchards are of sufficient area to need large waterways.

The subdivision of land often adds greatly to the difficulties of water disposal on individual properties. It is generally known that the diversion of water from its natural course on to a neighbour's property may give him cause for legal action. It is often

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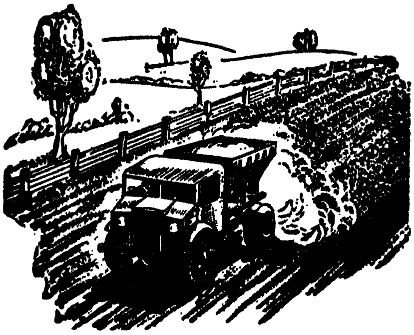

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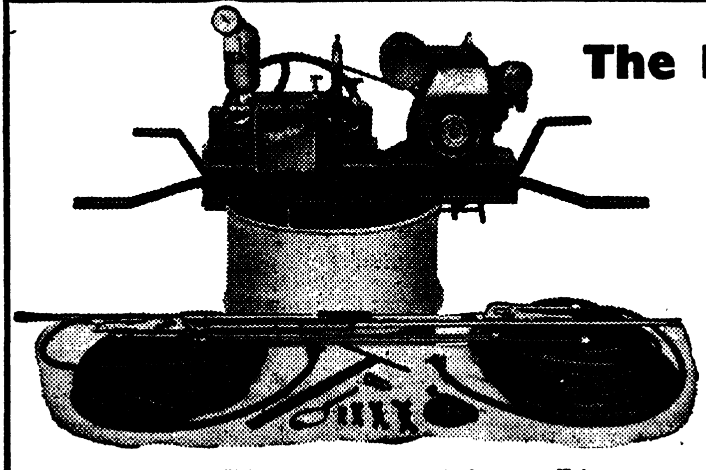

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necessary to convey run-off water downhill along a boundary fence for some distance. A grassed waterway will overcome this difficulty.

Some orchard contour plantings, particularly on larger areas, must be designed to dispose of water through the cultivated area. This can be done safely with a good waterway.

Reformed gullies as waterways have been mentioned previously. Natural drainage depressions are good waterway sites if they are not gullied and they are usually in good order on newly cleared land.

If a waterway is at right angles to the contour it can receive water from orchard blocks on both sides of it.

waterway site if necessary. This method represents an ideal which is rarely achieved on the coast.

2. When there is to be no inter-planting of vegetables and passionfruit, but tree planting is desired at short notice, define the planting design (positions of rows of trees), plant the trees and at the same time plant an all-over cover crop, taking proper care in its establishment. Either hand hoe around the trees in their first year or cultivate a narrow strip on each side of the trees.

Proceed immediately to construct and plant waterways, diverting run-off which is likely to reach them. When the waterways are well grassed but not before, construct graded banks. This procedure applies when banks are to be constructed between tree rows.

Fig. 5—Graded Drainage Banks which Discharge Temporarily into an old Erosion Gully (left centre of picture) until the Waterway (right centre) is well Grassed.
Mr. A. Talland's property at Peat's Ridge.

Guard the Newly-constructed Waterway While the Grass is Growing.

A new gully on a headland or a washed-out waterway is not a pleasant sight. The fruitgrower must forgive what may seem to be tiresome persistence on the part of extension officers when they urge care in water disposal. Without this care a contour-planted project is unsound. The biggest loser is the owner of the property.

Safeguards against the washing out of waterways (see Fig. 5) are:—

1. Select sites for waterways while the cleared area is in the rough. If it has been cultivated, plant a cover crop. Construct and plant grass on the waterways, leaving the designing of tree plantings and construction of drainage banks until the waterways are well grassed. Divert run-off from the

3. When immediate, intensive use of the land is desired—citrus trees, passionfruit and/or vegetables—the safest procedure is:

(*a*) Design tree row positions.

(*b*) Construct banks.

(*c*) Construct training banks on each side of the waterway. These are temporary banked drains into which graded banks discharge. They may suffer some washing out if storm rains occur, but the permanent waterway will be protected.

(*d*) Construct and plant the waterways.

(*e*) Plant citrus trees and any other inter-crop.

(*f*) When the waterway is grassed, construct discharge ends of graded banks across the training bank into the waterway.

(*To be continued.*)

SUPPLEMENTARY WATERING OF BANANAS

To Overcome a Major Hazard to Efficient Production.

(*Concluded from page* 92).

H. W. EASTWOOD, H.D.A., SPECIAL FRUIT OFFICER (TROPICAL) AND
J. G. JEATER, H.D.A., FRUIT OFFICER.

ALMOST every year during the late winter, spring and early summer, most banana plantations in this State suffer from lack of soil moisture, with consequent ill-effects on ultimate yields.

Most banana areas, however, are well supplied with fresh water streams and springs which need only storage development to enable supplementary watering to be carried out as required.

It is the purpose of this article, which commenced last month, to describe this method of irrigation.

Water Storage.

Usually dams, wells, weirs, etc., are constructed to supplement the normal flow of the supply, so that extra pumping hours may be obtained. When such work is undertaken the supply hole capacity plus the normal rate of flow should be capable of keeping the pump working for the required time of irrigation. If 5 acres are to be watered with an acre inch with a pump delivering 2,000 gallons an hour, that can be done by pumping for 5 days for 11 hours a day. If the normal flow of water is 1,000 gallons an hour then water storage at the pumping point is required. This would need to be a minimum capacity of 11,000 gallons to keep the plant in operation for the required time each day.

The type of construction for storage can only be determined after careful selection of site, consideration being given to soil characteristics and water holding power and normal and abnormal rates of flow of the stream, but several points to be remembered are:—

(1) Holding walls to be strong and watertight.

(2) All surfaces liable to erosion by normal surplus overflow or flood conditions, such as spillways, to be protected by concreting or grassing.

(3) In the case of springs the natural flow of water through the storage well when not pumping should be encouraged.

(4) Whenever possible build a flushing gate at the well base to allow for cleaning out and repair work.

(5) Where silting is liable to occur, provide silt pits before the inlet to the dam.

On all matters relative to conservation of water excellent detailed advice is available to plantation owners from officers of the Water Conservation and Irrigation Commission of New South Wales, and their services can be invaluable to anyone intending to instal irrigation. The Farm Water Supplies Act, administered by the Water Conservation and Irrigation Commission, provides for developing farm water supplies

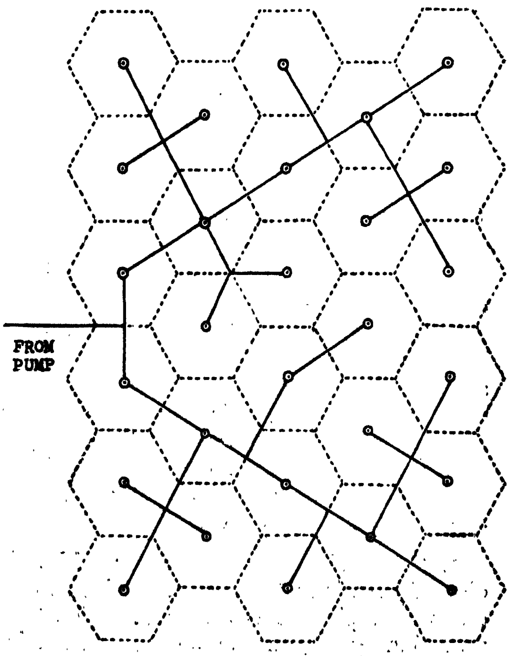


Fig. 7.—Suggested Design for Lay-out of Permanent Piping when using Overhead Sprinklers with wide and circular Coverage.

or individual farm water. A bulletin on this subject, entitled "More Water," is available from the Commission.

Reticulation and Distribution of Water.

The reticulation and distribution of water from the main pipe line throughout a plantation presents many difficulties owing to the

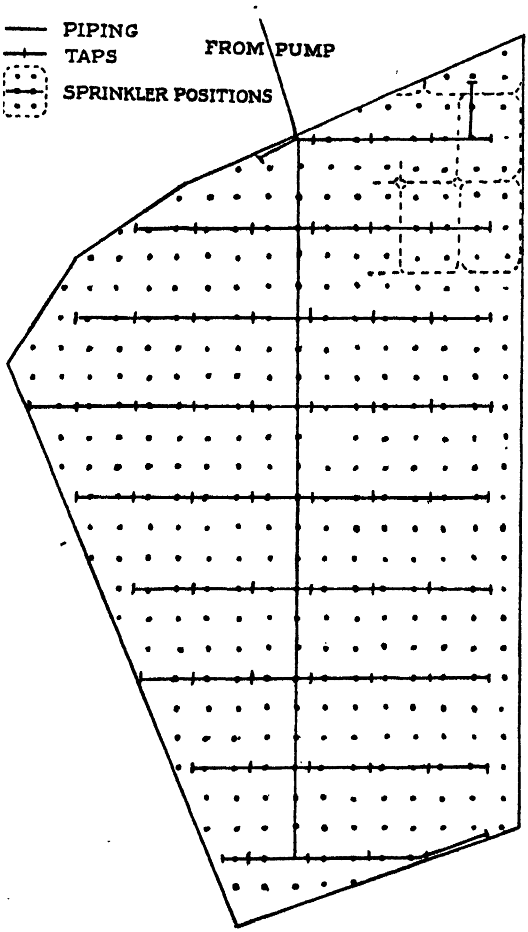


Fig. 8.—Design for Lay-out of Piping using Permanent Laterals from Main.
Laterals tapped to flexible hoses; six sprinkler positions to each tap.

habit of growth of the banana and the practice of planting on the square system as is usually adopted to-day. The steepness of the slopes and the rough, often boulder-strewn ground surface of the areas planted do not allow of orthodox methods of water application. Nevertheless modification of present accepted irrigation systems using sprinklers can be made to suit each layout and water applied satisfactorily.

To determine suitable methods of applying water to banana plantations, trials of various layouts and sprinklers have been made at the Duranbah Experiment Plot, Tweed River, and are still being carried on at that locality. Valuable experience has been gained and the results so far are encouraging. Although further work has still to be undertaken, the progress made has indicated certain points of interest.

(1) There appears to be little or no advantage in having the sprinklers above the plants; in fact the extra cost of installation, difficulty of attending to sprinkler heads, impracticability of the method with tall varieties, uneven distribution on windy days far outweigh the better spread overhead sprinklers can give.

(2) A sprinkler head should have the following characteristics:—

(*a*) A large enough orifice or orifices to reduce trouble from blockages to a minimum.

(*b*) Be able to give reasonable spread at low pressures.

(*c*) "Break" the water into fairly large globules to reduce wind drift.

(*d*) Wide "spread" to reduce piping installations or movement of lines to a minimum.

(*e*) Apply water at the rate of ½ to 1 acre inch per hour.

(*f*) Sturdiness and none, or very few wearing parts.

(3) In rough or rocky plantations portable irrigation pipe lengths are too easily damaged and not convenient to move, although cost of installation of this method is the cheapest.

(4) Permanent reticulation pipe lines, in spite of extra initial outlay, are at present functioning most satisfactorily. The labour costs saved over that expended on moving portable lines will soon cover the initial outlay. Also the wear and depreciation of permanent water piping are much less than with temporary or portable irrigation piping (see Figs. 8 and 9).

(5) Lateral reticulation lines should follow, if possible, the contour of the plantation. Varying levels create uneven rates of flow from the sprinklers along the line. This can be corrected by controlling cocks

at each sprinkler. When planting for irrigation the planting should be done on the contour.

(6) Plastic hose is outlasting rubber hose of similar value under severe field trials, and is much lighter to handle. Layouts involving permanent lateral pipe lines with portable hose leads are of moderate cost and reduce moving time to a minimum (see Figs. 9, 10 and 12).

(7) Gascocks in all sizes up to 2 inches are satisfactory as water cocks and cheaper than gate valves.

the rate of ½ inch per hour. This lower rate of application is also suitable for red volcanic loams and is favoured. Such a rate of application allows for more coverage per pumping unit and ensures a thorough and slow penetration.

Useful Formula.

The formula for calculating the number of hours it is necessary to operate a sprinkler in each position in order to apply water at the rate of 1 acre inch is:—

$$H = \frac{A}{2NR}$$ where—

Fig. 9.—One of a Battery of Twelve Sprinklers connected to a Permanent Line by 30-feet Hose Lengths.

Water Application and Requirements.

The sloping sites on which bananas are planted usually have excellent surface and sub-surface soil drainage and some dangers of overwatering associated with flat land do not occur.

Nevertheless precautions should be taken that rates of application and quantities applied have no detrimental effect on the present and future condition of the soil.

Rate of application should be such that the root zone is wetted, but that no run-off is likely to occur, while leaching should be guarded against to prevent the wastage of water and available plant foods. Do not water to cause surface washing.

The well-drained red volcanic loams and soils of similar nature readily take water at ¾ inch to 1 inch per hour. For heavier and tighter soils and forest land apply at

H = Hours required in each position to apply water at the rate of one acre inch.

N = Number of sprinkler positions for each tap.

A = Total area in square feet covered from all the sprinkler positions for each tap in a pipeline.

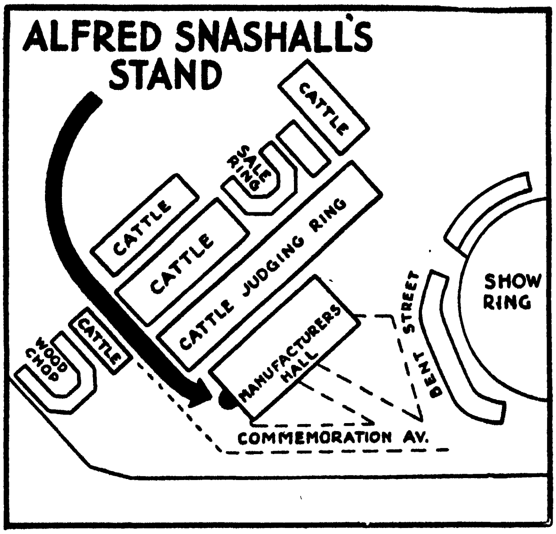
R = Rate of discharge in gallons per hour per sprinkler.

As an example:—

Suppose that the area total served by six sprinkler positions for each tap in a pipeline, is 48 feet x 72 feet = 3,456 square feet, and that the rate of discharge per sprinkler is 3 gallons per minute.

In this example:—

A = 3,456 square feet.



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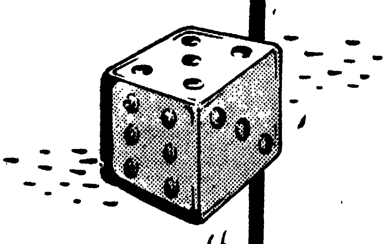

"Lucky farming" days are over!

"Tickle it with a hoe and it laughs with a harvest."

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N = 6 sprinkler positions.

R = 3 x 60 = 180 gallons per hour per sprinkler.

Applying the formula $H = \frac{A}{2\,NR}$ to find the time in hours necessary to apply water

Fig. 10.—Permanent Pipelines with Sprinklers at Ground Level.

at the rate of 1 acre inch in each sprinkler position—

We find—

$$H = \frac{3,456}{2 \times 6 \times 180} \text{ hours}$$

$$= \frac{3,456}{2,160}$$

$$= 1.6 \text{ hours}$$

= 1 hour 36 minutes.

Irrigation—A New Stage in the Development of the Industry.

With the judicious use of irrigation and its consequent beneficial results the banana industry enters a further stage in its development. The days when suitable virgin land was common have passed, but by supplementing the natural rainfall when necessary, to maintain a suitable soil moisture condition, regular yields as good as those obtained from the best virgin scrub land may be anticipated from what is now considered second-class land.

Yields of 300 to 400 cases per acre each year require more intense methods, which in turn reduce the acreage one man is able to tend. When high yields can be sustained one man will be fully occupied with 3½ to 4 acres of bananas.

Fig. 11.—Simple Sprinkler Holder for use with Flexible Hose.

When the season is good, plan, construct and instal your supplementary watering system so that it will be ready for the dry spells that inevitably come.

CURING of tobacco in the Texas and Ashford districts is now in full progress, reports the Division of Plant Industry of the Department of Agriculture. A departmental crop specialist who recently visited these areas observed that the crops were yielding well and the leaf, especially at Ashford, appeared to be of good quality.

A slight loss had been incurred through mould, and in a few isolated crops by a late attack by heliothis caterpillar. Indications were that a yield of about ½ ton to the acre should be realised throughout the New South Wales crops.

CERTIFIED bean seed may be in short supply next season. Many of the sowings on the South Coast have been made rather late, although some crops show promise of heavy yields of seed.

A small area of the Department's new bean "Windsor Longpod" has passed its first inspection satisfactorily.—DIVISION OF PLANT INDUSTRY.

APIARY NOTES

NEWCOMERS TO BEEKEEPING

Need Experience to Become Efficient.

W. A. GOODACRE, Principal Livestock Officer (Bees).

DURING a season of heavy honey production, such as that now nearly ended, it is usually found that many people became interested in taking up beekeeping. They do so as the result of observing local apiarists, or migratory beefarmers temporarily established in their district extracting honey in large quantities and experiencing little difficulty as far as apiary management is concerned. Such seasons, however, are unusual, and to succeed in the industry newcomers must learn to manage their apiaries under average conditions.

Actually a progressive season such as that now concluding is a good time to commence in beekeeping, for little trouble is experienced in establishing nuclei or full colonies of bees. In such a year excellent combs could be readily built up from full sheets of comb-foundation for extended accommodation when nuclei colonies were transferred to full-sized hives; also for replacing cull combs in any nondescript hives which may have been purchased for a beginning in beekeeping. Bees will not build combs readily unless a honey flow is in evidence.

Continued Success Demands Efficient Management.

The continued success of these newcomers, however, will depend on the interest and study they put into their work during the next season or two, when conditions are not likely to be so favourable. It is a fact that practically all of the important honey trees flowered and secreted nectar freely during this 1948-49 season, and, as a general rule, the majority of these species only flower once every second or third year. As a result, there will certainly be some wide breaks between honey flows during the next season or two—particularly for young beekeepers who have not reached the stage where migratory work can be attempted.


Inspecting Quiet Bees in a Small Apiary.

Even experienced and well-equipped migratory men do not expect to produce heavy crops of honey next season from spring onward. They will most likely exploit new country where different species of flora occur to those which flowered this season. Maybe the Snowy River and the Mallee country, which attracted such apiarists when similar conditions prevailed a few years ago, will again receive attention.

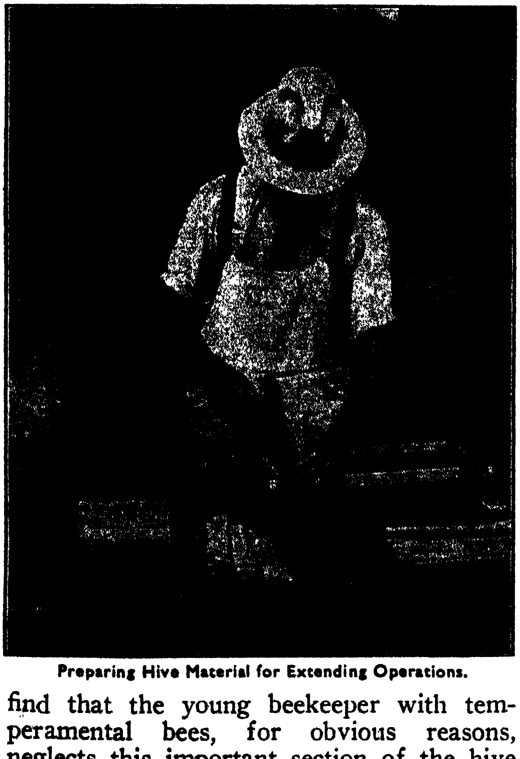
These new beekeepers will need sound advice if they are to become efficient apiarists. If they have started on a good foundation earlier this season, by establishing the bees in sound, properly-constructed

hives with well-built combs, and have attended to this equipment, they have made a good start towards the future success of the venture.

Temperamental Bees are a Source of Trouble.

Another very important matter which must be given attention by the newcomer is the breeding of bees, particularly in respect to securing a good strain of Italian stock which can be handled in comfort.

It is practically impossible for the young beekeeper to maintain interest in the working of nondescript strains of bees, particularly if they are temperamental, which is more likely to be the case than amongst well-bred Italian bees. It is possible to control the latter with a minimum of smoke, and examination right down to the brood nest, which is essential, can be carried out in comfort. On the other hand, we so often



Preparing Hive Material for Extending Operations.

find that the young beekeeper with temperamental bees, for obvious reasons, neglects this important section of the hive and depends on what can be observed from a hurried inspection of the top storey—which is not sufficient.

Re-queen the Irritable Colonies.

Very few beefarmers operating on a commercial basis will put up with even one temperamental colony in the apiary. Such stock is marked for early re-queening with a young queen from a docile strain of bees. This is the obvious way to overcome the trouble, for when the worker progeny of a docile queen fully replaces the savage ones, which is only a matter of about seven to eight weeks under active seasonal working conditions, peace again prevails.

Apart from making the work difficult and the young beekeeper unhappy in his work, the keeping of irritable bees in the apiary is often responsible for trouble in other directions and affects the good name of bees amongst the neighbours and general public. Large numbers of hives of bees are kept in towns and villages and when they are properly cared for no trouble is likely to arise. However, where temperamental bees are kept, neighbours and public may be disturbed, and the beekeeper must avoid this at all costs. The introduction of a new queen is the remedy and is by no means a difficult job, nor is it costly. Untested Italian queen bees which are quite satisfactory may be purchased from well-known bee-breeding apiaries at 8s. 6d. each.

Valuable Departmental Literature Available.

To become conversant with modern methods of control and management of bees, all young beekeepers should procure a copy of the Department's book entitled "Bees and Honey," price 2s. 9d. postage paid. Maybe the beginner will also receive advice from friendly beekeepers anxious to give helpful guidance, and a good deal of this may prove to be sound, but it is a good plan to check up with "Bees and Honey." The book describes in detail the best hive material to use, and how to employ it, and where it is necessary to make home-made hives during these times of shortages of supplies from the factory, "Bees and Honey" gives the correct measurements together with illustrations to assist in this direction.

Conditioning Colonies for Winter.

The newcomers to apiculture will shortly have to face their first experience of wintering bees. Fortunately this should not prove difficult following such a bountiful honey season. The colonies should have ample supplies of honey stores to see them through. In those instances where nuclei colonies have been procured so late that they did not have a chance to gather

sufficient supplies, needy ones can be supplied with full combs from other well-stocked hives.

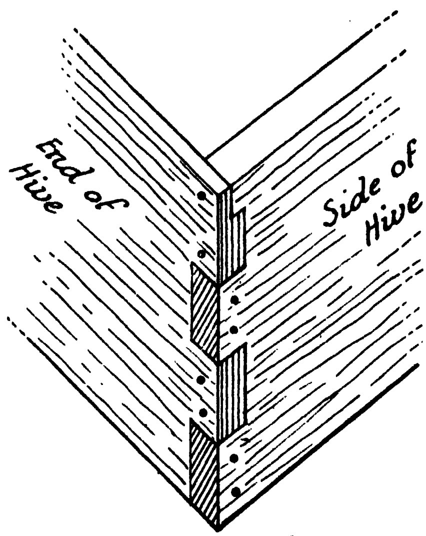
There is yet time for some further progress in building up the good population of young bees so desirable for success in getting the bees through until favourable spring conditions prevail. Climatic conditions are usually mild enough during April and for a week or two in May for brood-rearing to be well maintained in the hives.

Natural Pollen Supply is Most Important.

The availability of supplies of pollen from the fields is very important in inducing the colonies to be progressive in brood-rearing. Where there is a shortage of this natural nitrogenous food, it will be advisable to move the bees to a place where pollen is obtainable.

Special significance is attached to pollen supplies during the late autumn in country where bees have been working a late flow from inland Yellow Box or coastal Grey Ironbark. Bees suffered severely during the late summer flow from Yellow Box because of the acute shortage of pollen. The result was a weakening of the colony strength and a lowering of the bees' vitality generally. Hence a good supply of natural pollen is necessary late this season to allow of a complete replacement of old bees for successful wintering.

Those beekeepers with facilities to transport hives of bees have moved on to special wintering country. Coastal areas where Bloodwood (*Eucalyptus corymbosa*) has



Sketch of Corner Joint Recommended for the Home-made Hive.

The hive is 9½ inches in depth and ⅞-inch timber is used in its construction.

been flowering, and along the South Coast where the Spotted Gum (*E. maculata*) is well budded for winter flowering, have proved attractive to the migrator.

Breaches of Farm Produce Agents Act.

Departmental Prosecutions.

"PROSECUTIONS launched recently by my Department against two agents operating at the City Markets for breaches of the Farm Produce Agents Act were successful, and in both instances the defendants were convicted and fined by the Court," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) to-day.

"In the first case proceedings were taken against an agent company for rendering a false return to a grower in respect of a consignment of bananas," said Mr. Graham. "The facts in this case are that the agent company rendered a false account to the grower in that at the time the account was rendered the fruit had not been sold. Proceedings were also taken against this company for failing to keep a consignments received and accounts sales book. A fine of £20 was imposed in respect of the first charge and £10 in respect of the second charge.

"The facts in the second case are that the agent received a consignment of cabbages from a grower in the country," added Mr. Graham. "His return to the grower did not show details of the quantities of cabbages sold at different prices and, secondly, he did not enter these details at the time of sale in the cash sales book required to be kept by him. On each charge the agent was fined £5.

"These two cases will serve as a warning to agents of the necessity for conforming with the regulations under the Farm Produce Agents Act, particularly in regard to the keeping of dockets," added Mr. Graham.

"Growers can rest assured that my department will continue to supervise the operation of the docket system to see that it is rigidly adhered to," concluded the Minister. "Where any irregularities come under the notice of Departmental officers, legal proceedings will be instituted immediately."

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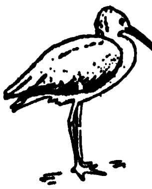

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PLANT DISEASES

BLACK SPOT OF CITRUS

Recommendations for Control on the Central Coast of New South Wales.

Mr. T. B. KIELY, Plant Pathologist, who has spent several years studying Black Spot of citrus in the Gosford district has developed a series of spray programmes each of which has been designed to suit a particular stage of growth or other condition of a tree to be treated.

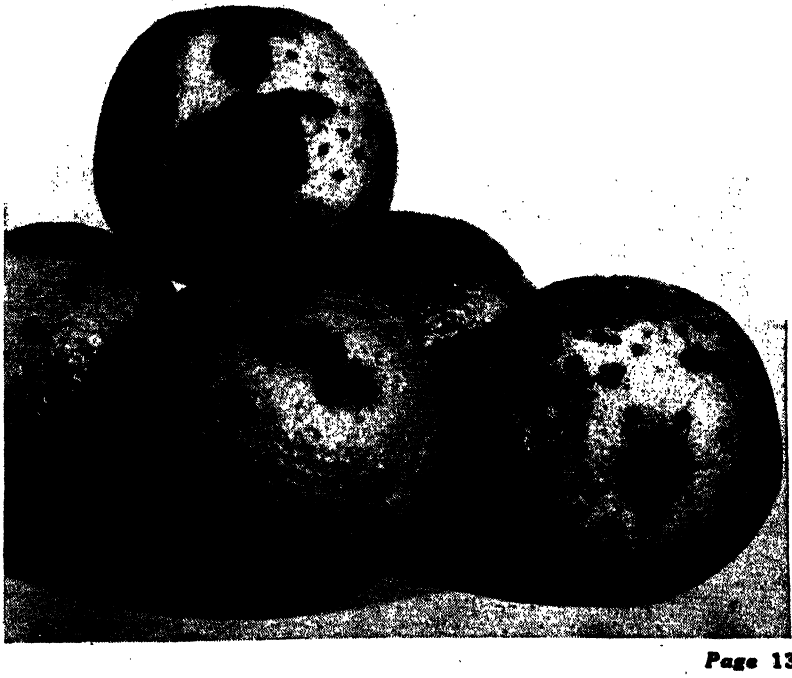
The following opinions, which are based on experimental evidence, have been expressed by Mr. Kiely.

By far the most serious citrus fruit disease with which the Central Coast orchardist must contend, is Black Spot. All commercial varieties are affected to a greater or lesser extent; however, the most serious losses are with main crop Valencia fruit. Under epidemic conditions the entire crop of maturing fruit in an orchard may be affected and rendered largely unsaleable. Even in years when the effects of the disease are less severe, up to 50 per cent. of the mature fruit may develop Black Spot.

Apart from the actual economic loss occasioned by the development of Black Spot on mature fruit on unsprayed Valencia trees, the disease has several other undesirable features.

Epidemics are likely to occur from early October to the end of December. When the disease commences to develop on the fruit in unsprayed orchards, growers with affected trees usually attempt to harvest the greater part of their crop. This creates panic conditions on the wholesale fruit markets, rendering slightly affected fruit unsaleable, and greatly depressing the price even of choice, sound Valencias. With unsprayed trees, growers tend to harvest the slightly spotted fruit first, resulting in lower returns for their fruit than they would otherwise have received had they picked for size rather than Black Spot affected fruit. The apparent advantage of "picking for spot," namely the removal of diseased fruit from

Black Spot of Orange.



the tree, is more than offset, as the remaining sound fruit on the trees has developed a large percentage of Black Spots from latent infections by the time the next picking has been carried out. Expenditure on manures and fertilisers to guarantee good crops often appears and usually is uneconomic to the grower, as the increased production is usually affected with Black Spot.

The adoption of preventive measures against this disease is an excellent form of insurance, as the disease is usually serious three years out of four on the Central Coast. Sprayed fruit may be allowed to remain on the trees until stability develops in the wholesale fruit market after the end of December. Better returns are thus assured and small-sized fruit may be allowed to increase in size without fear of Black Spot development, thus assuring an increase in yield due to the adoption of the spray programme alone. Further, an increase in fertilising means extra returns from disease-free fruit. Hence it is apparent that the control of this diease gives a greatly increased stability to this industry.

Factors Influencing Control Measures.

The problem of controlling Black Spot is somewhat different in old than in young Valencia trees. This is partly due to the greater vigour of young trees enabling them generally to withstand the application of stronger Bordeaux sprays than is possible on old trees. The disease itself, too, is more easily controlled on young trees. For this reason, several programmes are recommended for the control of Black Spot, the choice depending on the age of the trees, their vigour, and, of course, the final result obtained in controlling the disease.

The time of harvest and the locality where the fruit is to be marketed are also most important considerations. If fruit is required for the export market, or is to be sent into tropical areas, or if fruit is intended to be kept on the trees until late in the season, then only those programmes giving complete protection to the young fruit during the period that it is susceptible to infection, should be followed.

Sprays for Young Trees.

For young trees up to ten years of age affected with Black Spot, a petal-fall Bordeaux mixture spray application of 4-4-80 strength, followed six to eight weeks later by a second Bordeaux mixture application of 2-2-80 strength is recommended. The initial spray should contain ½ gallon of white spraying oil to each 80 gallons of fungicide, to function as a sticker. The second Bordeaux mixture application should be combined with white spraying oil at scalicidal strength to combat any tendency for an increase in White Wax Scale insect populations* due to Bordeaux mixture sprays. The actual time of application of the second combination spray will be determined by the most opportune date to secure a maximum kill of the larvae of White Wax Scale in the trees to be sprayed. Experience indicates that this will generally be six to eight weeks after the date of application of the petal-fall spray. The second scalicidal white spraying oil application will also contribute to an improved control of the disease.

Sprays for Older Trees.

Where Black Spot is to be controlled in older Valencia orange trees, a greater number of weak Bordeaux mixture spray applications may be necessary. For trees up to twenty years old, in a reasonable state of vigour, it is recommended that Bordeaux mixture sprays of 2-2-80 strength be applied at petal-fall, and again six and twelve weeks after that date. In this three-spray programme, white spraying oil should be used at "sticker" strength in the first and third sprays and at scalicidal strength in the second spray application.

With old Valencia orange trees, where the disease may be difficult to control, a programme consisting of four weak Bordeaux mixture spray applications may become necessary. It is recommended that these spray applications should be made at intervals of five weeks, the first spray application being made at petal-fall. Generally, these sprays should consist of Bordeaux mixture 1½-1½-80 strength; however, with old trees in a very good state of vigour, a modification of this recommendation may be worthwhile, resulting in excellent control of the disease by increasing the strength of each of these four spray applications to 2-2-80.

* The Chief Entomologist recommends the use of a white spraying oil emulsion at the rate of 1 in 40, to be applied when the majority of the larval scales have emerged from beneath the parent scales. Under Central Coast conditions this will usually be about mid-December. A second white spraying oil application should be made during February under those conditions where Red Scale, Purple Scale or Rust Mite infestations are likely to be serious.

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With a four-spray programme, because of the altered intervals between the dates of spray applications, it may not be opportune to combine the second Bordeaux mixture spray application with the first scalicidal oil application. It may be necessary to apply this spray separately. The second scalicidal oil application can, however, be generally combined with the last Bordeaux mixture application, fifteen weeks after petal-fall.

From time to time it becomes necessary to make a single application of Bordeaux mixture of 4-4-80 to 6-6-80 strength to Valencia and Washington Navel orange trees at petal-fall in October, in order to control the Melanose disease on the fruit. Weak Bordeaux mixture spray applications, recommended for Black Spot control, will also give very satisfactory control of this disease on Valencia fruits. Hence, where these four-spray programmes are intended, the use of a strong initial Bordeaux spray is unnecessary.

Some Precautions.

In achieving a satisfactory result with any of the recommended control measures for Black Spot, a number of points should be borne in mind.

The Bordeaux mixture sprays should be efficiently prepared. The petal-fall spray applications should not be made too early. Obviously, with a fairly large Valencia orange orchard the entire planting cannot be sprayed in one or two days; however, good results are assured if the petal-fall application does not extend more than a week. Where definite intervals are specified between subsequent spray applications, these should be carefully observed, as departure from them will result in less satisfactory disease control.

For best results the spray should be applied at 300 lb. pressure, covering the entire outer wall of foliage and young fruit. The success or otherwise of the control measures will depend largely on the efficiency of spraying. Large trees capable of carrying 10 bushels of fruit will require up to 10 gallons of spray on each spraying date, and small trees less, in proportion to their size.

Chemical Elements and Plant Growth.

IN common with all other forms of life, plants must receive a balanced range of food materials if they are to grow and function normally. These food materials are composed of a restricted number of chemical elements, usually combined with other elements to form simple chemical compounds.

Under normal conditions some of these are in abundant supply; these are the elements carbon and oxygen which are withdrawn from the air in the form of carbon dioxide and oxygen gas. Hydrogen, another essential element, is derived from water which must sometimes be supplied by irrigation.

The "Big Three."

Plants require more of some elements than of others and only the richest soils contain sufficient nitrogen, phosphorus and potassium, which are major requirements, to keep crops growing continuously without replacement of these elements in the form of fertilisers. So important are these three materials that they are frequently spoken of as the "Big Three."

Other Major Elements.

In addition to nitrogen, phosphorus and potassium, other elements are required in considerable amounts by plants; these include sulphur, magnesium, calcium, and, to a lesser extent, iron.

The "Trace" Elements.

Even when all the above are present in the soil, the plant cannot grow without minute amounts of such substances as manganese, boron, zinc, copper and molybdenum.

Each of the elements listed plays its own part in the nutrition of the plant, some species of plants requiring more, and others less, of each element. However, the chemicals must be kept in a correct balance; for example, a tomato plant requires comparatively large quantities of phosphorus in ratio to nitrogen, whereas, in a lettuce plant, the opposite is true.

Warning.—It is not uncommon in New South Wales to find soils deficient in such

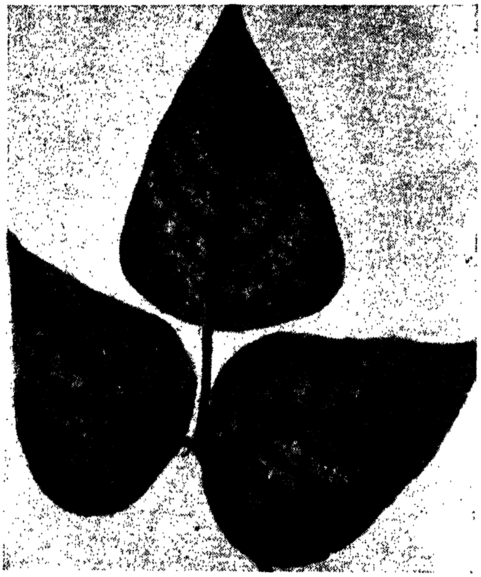

Fig. 1.—A Mottled Leaf Condition in Garden Beans. This plant received insufficient Manganese.

elements as manganese, boron or molybdenum, and unthrifty plants rapidly become normal when the missing chemical is supplied; but plants require only limited amounts of such materials and are injured if they are applied in excessive amounts.

Factors Responsible for Deficiency in Soil.

The sand or clay which constitutes the great bulk of soil is derived from rocks which have softened and partly disintegrated with the passing of geological time. They therefore contain no chemical elements other than those which were in the original rock, or which have been added to them by percolating water or by the breakdown of plant and animal remains. On the other hand, they may lose some of their water-soluble elements as a result of leaching. In other cases, certain elements which may be present in the soil may react with other chemicals and form compounds which plants are unable to utilise.

Table I shows certain elements which are commonly lacking in soil, suggests why they could be lacking, and gives methods for correcting the defect.

TABLE I.—CHEMICAL ELEMENT DEFICIENCIES—THEIR ORIGIN AND REMEDY.

Element Deficient.	Cause of Deficiency.	Remedial Action.
Nitrogen ...	(1) Leaching in light soils lacking organic matter. (2) Continuous cropping without replenishing nitrogen supply.	(1) & (2) Liberal use of nitrogenous fertiliser, *i.e.*, sulphate of ammonia, nitrate of soda, blood and bone. Building up humus content of soil with organic matter. Inclusion of legumes in the rotation. Treatment of legume seed with appropriate nodule forming bacteria.
Phosphorus...	(1) Continuous cropping without using a phosphate-containing fertiliser. (2) Phosphorus is insoluble in acid soils.	(1) Use of superphosphate or blood and bone fertilisers. (2) Use of agricultural lime or dolomite.
Potassium ...	Leaching in light sandy soils or lack in soil.	Potassic fertiliser, *e.g.*, sulphate of potash at 2 cwt. per acre followed by a mixed fertiliser.
Magnesium ...	Leaching in light sandy soil or lack in soil.	Dolomite at 2 tons per acre 3 months before planting. Affected plants sometimes respond to a spray containing 1 lb. Epsom salt in 10 gallons water.
Iron ...	Calcareous or alkaline soils.	Sulphur at up to 500 lb. per acre depending on degree of alkalinity Affected plants sometimes respond to a spray containing 1 to 2 lb. ferrous sulphate in 10 gallons water.
Manganese ...	Calcareous or alkaline soils.	Sulphur as for iron. Manganese sulphate at 50–100 lb. per acre before sowing. Trees, etc., will often respond to a spray containing 5 lb. manganese sulphate and 3 lb. hydrated lime in 100 gallons of water.
Calcium ...	Lack of lime containing fertiliser. Leaching in sandy soils.	Lime up to 2 tons per acre.
Boron ...	(1) Overliming ... (2) Deficient in soil.	Borax—5 to 10 lb. per acre.
Molybdenum	(1) Acid soil ... (2) Deficient in soil.	(1) Lime or dolomite at 2 tons per acre. (2) Ammonium molybdate at 1 lb. per acre or crude sodium molybdate at 3 lb. per acre.

Fig. 2.—The Dead Areas on this Cabbage Leaf were caused by a Deficiency of Potassium.

Quantities of Elements Used by Plants.

Though plants vary in the amount of the various food materials they use and the actual quantities of the various elements used are in proportion to the weight of the crop, some idea of the amount of fertiliser to use can be gained from a study of the requirements of a corn crop producing 100 bushels of grain per acre. Such a crop would utilise 20 inches of rain, 800 lb. sulphate of ammonia (nitrogen), 300 lb. muriate of potash, 400 lb. superphosphate, 80 lb. sulphur, 150 lb. Epsom salt, 80 lb. agricultural lime, 2 lb iron, 1 lb. manganese sulphate, ¼ lb. borax and smaller quantities of zinc, copper and molybdenum.

Fig. 3.—A Hollow Heart Condition of Turnip resulting from Deficiency of Boron.

Deficiency Diseases.

When any essential element is lacking, a plant changes its growth habit. It is no longer thrifty and its leaves may become pale-green, yellow, white, purple, greyish, mottled, or even develop dead areas. The diseased symptom varies with the identity of the deficient element. Size and shape of the leaves, stems, etc., are also influenced by various elements but abnormalities of colour, size and shape of a given species of plant is constant and suggestive of the element that is missing. In effect, the plant is plainly showing the nature of the fertiliser it requires.

Many obviously diseased plants are not the victims of parasites; they are merely under-nourished.

NEW PLANT DISEASES.

DURING the six months ended 31st December, 1948, the following diseases were recorded for the first time in New South Wales:—

Acacia Farnesiana (Acacia)—*Uromycladium notabile* (Ludw.) McAlp. (Rust); Moree, Pallamallawa.

Amygdalinus persica (Peach)—*Verticillium dahliae* Kleb. (Black Heart); Griffith. *Rhizoctonia solani* Kuehn. (Stem and Root canker of seedlings); Carlingford.

Ananas sativa (Pineapple)—*Heterodera marioni* (Cornu) Goodey (Rootknot); North Coast.

Anthurium sp.—Spotted wilt (Virus); Metropolitan.

Arabis blepharophylla (Arabis)—*Cystopus candidus* (Pers.) De Bary (White Rust); Metropolitan.

Brachychiton acerifolia (Illawarra Flame Tree)—*Phyllosticta* sp. (Leaf Spot); Yanco.

Brassica campestris (Swede turnip)—*Peronospora parasitica* (Pers.) Tul. (Downy Mildew); Metropolitan.

Bromus unioloides (Prairie grass)—*Rhynchosporium secalis* (Oud.) Davis (Leaf Spot); Wildes Meadow.

Citrus hystrix—*Sphaceloma fawcetti scabiosa* Jenkins (Scab); Narara.

Erysimum asperum (Siberian Wallflower)—*Plasmodiophora brassicae* Woron. (Club Root); Dundas.

Helichrysum bracteatum (Everlasting)—*Verticillium dahliae* Kleb. (Wilt); Dundas.

Lactuca sativa (Lettuce)—Spotted wilt (Virus); General. Present for many years but not previously recorded in lists.

Lilium candidum (Madonna Lily)—*Botrytis elliptica* (Berk.) Cooke (Leaf Spot); Mt. Wilson.

Linum usitatissimum (Flax)—*Sphaerella linorum Wollenweber* (Pasmo); Walla Walla.

Macadamia integrifolia (Queensland or Bush Nut)—*Septobasidium pseudopedicellatum* Birt (Felt fungus); North Coast.

Passiflora edulis (Passionfruit)—*Phytophthora cinnamomi* Rands (Root and Crown Rot); Port Macquarie.

Persea gratissima (Avocado pear)—*Gloeosporium* sp. (Associated with blackened areas on shoots); North Coast.

Prunus armeniaca (Apricot)—*Verticillium dahliae* Kleb. (Black Heart); Griffith.

Rhodanthe sp. (Everlasting)—*Verticillium dahliae* Kleb. (Wilt); Dundas.

Sagina procumbens (Pearl wort)—*Rhizoctonia solani* Kuehn. (Root rot and damping off); Metropolitan.

Saintpaullia ionensis (Cape Violet)—Spotted Wilt (Virus); Carlingford.

Solanum tuberosum (Potato)—Spotted Wilt (Virus); General. Present for many years but not previously recorded in lists.

Zinnia elegans (Zinnia)—*Bacterium* sp. (Bacterial leaf spot); Metropolitan.

Opening of Wagga Agricultural College and Experiment Station.

THE Wagga Agricultural College and Experiment Station was opened on 3rd March when the first Wagga Diploma Course in Agriculture began. An official function will be held later in the year to mark the occasion.

Making this announcement, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said, "The Wagga Diploma Course in Agriculture will extend over a period of three years. It is intended to meet the needs of students who wish to obtain a thorough knowledge of the various branches of agriculture and livestock and who intend taking up practical farming, teaching or instructional work as a profession.

"The curriculum will be similar to that provided for students in the Agricultural Diploma Course at the Hawkesbury Agricultural College.

"Mr. B. Doman, B.Sc.Agr., H.D.A., has been appointed Principal of the College," said Mr. Graham. "Mr. Doman has had a very wide and successful career in the Department of Agriculture. Whilst at Temora and Cowra Experiment Farms, Mr. Doman was able to obtain wide experience in the general management of experiment farms under southern wheat-growing conditions. As Lecturer in Agriculture at Hawkesbury Agricultural College he was in the unique position of being able to gain experience in college administration as well as in lecturing over the general field of agriculture.

"Mr. Doman has thus had both types of broad agricultural experience essential to enable him to satisfactorily assume the responsibilities as Principal of the newly-created Wagga Agricultural College and of the Experiment Station."

Diseased Plants for Examination.

AN increasing number of people are forwarding specimens of diseased plants to the Biological Branch of the Department for examination and recommendation of control measures.

It is unfortunate that in many cases the results of the service are disappointing to the grower. The main reason for the failure of the Department to diagnose the disease is because single, or only a few, leaves are placed in envelopes and are dried out and frequently pulverised before they are received. Often, too, dying leaves are the result of infections of the roots and therefore the leaf itself gives no clue to the real nature of the trouble.

Wherever possible, entire plants should be forwarded. They should first be wrapped in several thicknesses of newsprint and then in a container with fairly rigid walls. Postal express delivery costs only a few pence and assures that specimens arrive in a minimum of time and therefore in a fresh condition. Packages should be addressed Biologist, Department of Agriculture, Box 36A, G.P.O., Sydney.

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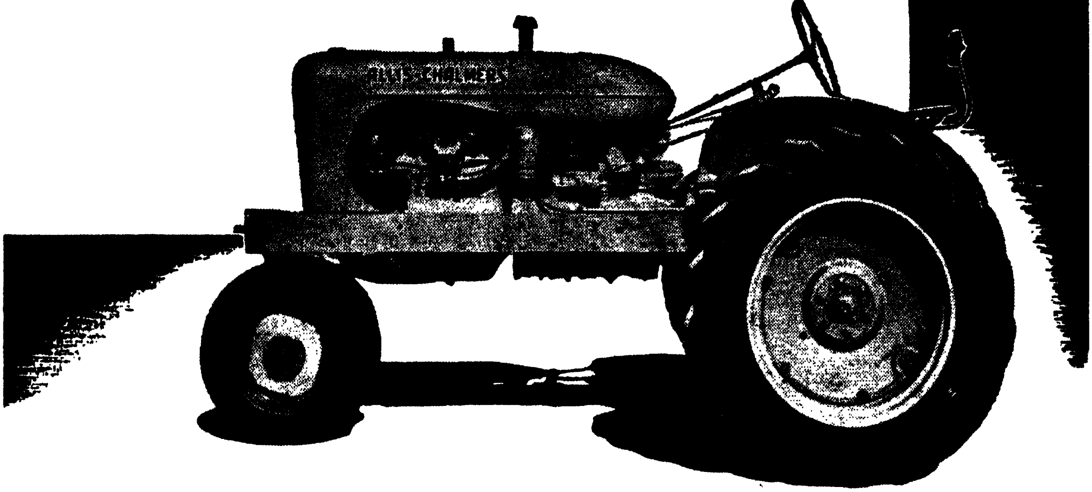

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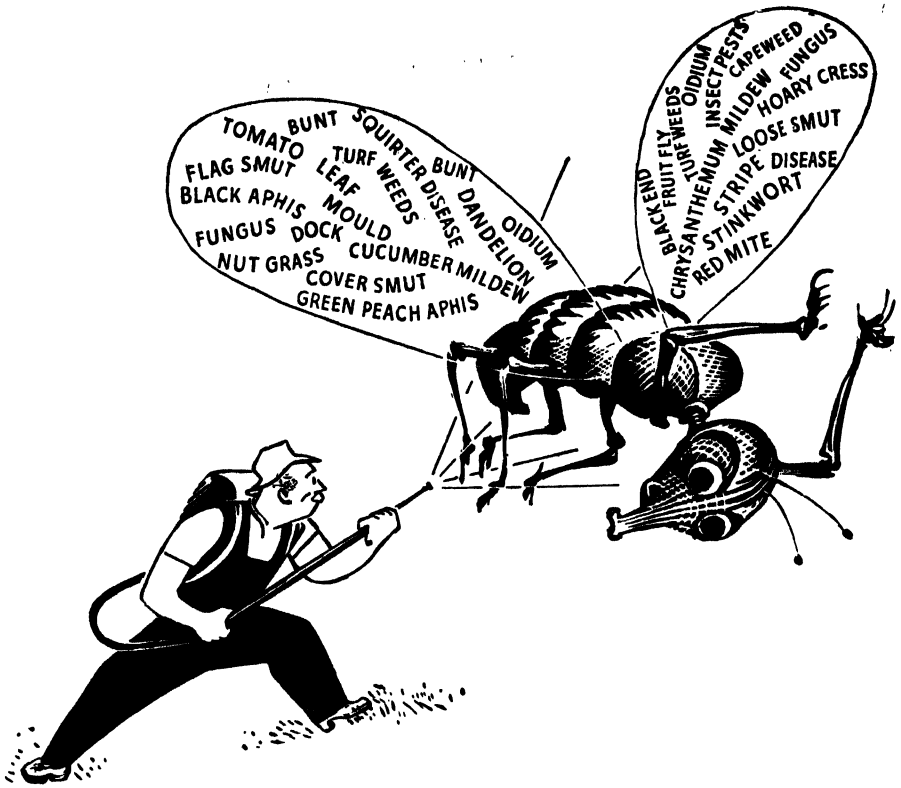

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CONTROL OF FRUIT FLY

Under Backyard Conditions.

VALUE OF NICOTINE SULPHATE BAITS.

P. C HELY, BSc.Agr., H.D.A., Entomologist.

INFESTATION by maggots of the Queensland fruit fly (*Strumeta tryoni*) in backyard summer fruits such as apples, apricots, peaches, plums, etc., is so severe in many coastal and some tableland districts of New South Wales as to make it almost impossible to gather any sound tree-ripened fruits in most seasons. Especially does this apply to fruits ripening from December onwards through the summer.

Experiments conducted on a tree in a backyard at Gosford for several years have shown the value of nicotine sulphate for the control of fruit fly under these conditions.

Measures taken in commercial orchards such as the frequent collection and destruction of fallen fruits, trapping, and the use of poison bait sprays containing sodium fluosilicate, or tartar emetic in sugar solutions, have not been generally so successfully practised in protecting individual backyard fruits from attack by fruit fly.

The principal reasons for this variation in efficiency of control measures under domestic, as compared with commercial conditions, is no doubt due largely to the fact that comparatively large numbers of flies are attracted to individual trees in backyards, whereas they are disseminated over a much larger tree population in the orchard. Individual backyard trees ripen their fruit at different times according to type and variety, and at any particular time there may be only one or two trees with fruit in an attractive condition in a particular neighbourhood. All flies in the vicinity are then likely to be attracted to these few trees in such numbers as to make any protective measures of little value unless they are capable of functioning very rapidly in preventing flies from stinging and depositing eggs.

For such efficient protection it is necessary that flies be affected within a very short time of alighting in the tree, and it will be necessary also that such a protective agent be available on the tree almost continuously throughout the susceptible period, usually 4-6 weeks.

Both tartar emetic and sodium fluosilicate have been shown by Allman [1] to bring about 50 per cent. mortality in laboratory populations of Queensland fruit flies in two days, where no alternative food material was available. Where suitable alternative food was available this time period was extended to seven days in the case of sodium fluosilicate, though this factor was of little importance with tartar emetic.

Laboratory experience with both fruit flies and bean flies (*Agromyza phaseoli*) had suggested to the writer that bait sprays containing nicotine sulphate might be well worth a trial in the field, particularly as a rapidly effective bait was necessary.

A trial of the bait was therefore initiated on a backyard peach tree at Gosford in the summer of 1944. Encouraged by the results obtained in that year, more carefully conducted experiments were continued on this same tree during the 1946 and 1947 seasons.

The tree in question is a large, Improved Flat China peach, about eight years old at the time of the first test, which had, despite various treatments, produced crops for some years past, completely infested with Queensland fruit fly.

An Experiment in 1944.

The first application of bait spray, made up of 1 fluid oz. nicotine sulphate in 3 gallons of water containing 1½ lb. sugar, was made on 3rd December with a knapsack spray pump, using about 2 pints of material at this and also at subsequent applications. Four such applications were made using 1 gallon of material in all.

An area of ground about 1 yard square was cleared beneath the tree on the east side and at intervals fruit flies falling on to this cleared space were collected and counted.

The total number of Queensland fruit flies actually collected on the cleared area up to 14th December when the crop was almost finished was forty-five, though there was no doubt that ants and ground insects

had removed numbers of flies during the intervals between collection, since they were seen doing this at the times the collections were made. As the cleared space represented about 25 per cent. of the total area of ground on which flies could fall beneath the tree, the probable yield of flies over the the whole area could reasonably be computed at about 180 fruit flies. It was of interest also that large numbers of assorted Diptera were brought down by the bait spray. When collected many of the fruit flies, though obviously affected were still moving. These were placed in glass jars and in all instances were dead within twelve hours.

At the time when the first spray was applied, ripe fruits on the tree were infested with fruit fly maggots and all fruits subsequently ripening during the next ten days were also infested. From the size of these maggots it was obvious that such fruits had been stung before the experiment commenced. However, most of the few remaining late ripening peaches were clean.

A 1946 Experiment.

In 1946 the first bait application was made on 10th November, approximately a fortnight before it was expected that the first fruits would be commencing to ripen. This spray and the next one applied consisted of nicotine sulphate and sugar solution at a similar concentration to that used in the 1944 experiment. Subsequent baiting was done with a similar spray, to which was added DDT emulsion with the idea of reducing the possibility of permanent recovery in flies which had taken a non-lethal dose of nicotine, and also of having some toxic residue on the tree should the sugar-nicotine residue be removed by rain. The actual formula used was:—

1 fl. oz. nicotine sulphate.
2 fl. oz. 20 per cent. DDT emulsion.
2 lb. sugar.
4 gallons water.

About half the total ground space beneath the tree was cleared and flies were collected daily and retained in cloth covered jars.

During the period 14-19th November, inclusive, during which time over 3 inches of rain fell, absence from the district prevented bait sprays being applied, or of fly counts being made. It was obvious from examination of the fly counts immediately preceding and following this period that lack of protection to the tree at this time was of considerable importance.

All fruit was counted and examined for fly infestation, and practically all were soft ripe when picked. Of the total crop of 721 peaches, 211, or approximately 30 per cent. were infested with maggots. This result, though incapable of being checked against untreated trees under identical conditions, was considered extremely satisfactory, as plums and apricots in nearby gardens at the same time were very heavily infested, whilst as already indicated the previous history of the tree had been that 100 per cent. fly infestation could confidently have been expected.

During the experimental period of one month thirteen applications of bait were made, the spray being flicked on to the tree with an ordinary household scrubbing brush, using half a pint of liquid at each baiting. As many different parts of the tree as possible received a small quantity of this bait, the time taken for the operation being about 5 minutes. Generally bait was renewed after rain had fallen.

As infested fruits containing half-grown maggots were recorded on the tree from 23rd November onwards it was likely that eggs from which these maggots developed might easily have been laid during the period from 14-19th November when no spray applications were made.

Of the 191 flies collected approximately 80 per cent. were females. It was noted also that all these females were fully gravid and turgid with eggs.

As in the previous experiment ants were quickly attracted to flies brought down by the bait and no doubt many were removed during the intervals between inspections.

As the area available for collection of flies was approximately half the ground space beneath the tree it seems likely that the total number of flies brought down during the period could reasonably have been expected to be in the vicinity of 400. Assuming that the same ratio of sexes was maintained this means that perhaps 300 gravid female flies visited the tree. Allman * has shown that under caged tree conditions in the field, twenty-five laboratory-bred female Queensland flies stung and infested 165 peaches during a three-week period, and stated that "It is at once obvious

that the percentage infestation of the fruit was light compared with expectations." Even on the basis of this result it is clear that in experiments reported here, the numbers of fruit flies actually brought down was more than sufficient to have completely infested the whole crop.

The 1947 Season.

The same tree was used again for an experiment in 1947 and the nicotine sulphate, DDT, sugar mixture as described in the 1946 experiment was again tested. Baiting was done every few days and generally was repeated if rain fell. Half the ground area beneath the tree was cleared and floored with heavy paper to assist collection of flies. All flies collected were placed carefully in a screened box cage secured in the fork of the tree and in which was placed a large twig taken from the tree in water. Any flies recovering could therefore be observed under fairly natural conditions and could have access again to the bait deposit. In addition to fruit flies, many miscellaneous insects collected were placed in this cage. In all cases any insects placed in this cage were dead within eight hours.

On 2nd November a glass fly-trap containing the standard vanilla-ammonia lure was hung in the tree in order to check up on fruit flies which were attracted to the tree and which might not be affected by the bait. Two flies only were captured in this trap on 7th November, and no further fruit flies were taken in the trap throughout the period. Flies were collected beneath the tree from 8th November onwards, and from the fact that no further flies were taken in the trap it seems likely that at least most of the flies which visited the tree were accounted for by the bait.

Continued showery weather was experienced almost throughout the test and rain was recorded on twenty-five of the forty-five days. Between 1st-18th December, when the experiment was concluded, rain was registered on twelve days. This necessitated more frequent baiting and a total of eighteen applications of approximately ½ pint each were made.

As in previous years ants were seen to remove some of the flies on the ground, but in addition this season a pair of peewits spent most of their time snapping up insects which fell beneath the tree. These birds were constant visitors to the area from mid-November onwards, and after the experiment was concluded were rarely seen. There is no doubt that the numbers of fruit flies collected would have been much larger had it not been for the activities of these birds.

Whilst weather conditions were difficult for fly control by spray baiting they were also not ideal for fruit fly activity on many days. However, flies were plentiful and active on suitable days, and at times during suitable periods on showery days, and gross infestations of apples, plums and peaches were seen in the immediate neighbourhood on untreated trees.

The first soft ripe fruits were picked on 23rd November and from then onwards only soft ripe peaches were taken. Towards the latter end of the harvest period fruit was gathered in a fully ripe condition by gently shaking the tree.

On 3rd December Fruit Inspector W. J. Spinks examined the tree and could find no infested fruits in a random sampling. At the same time he estimated the percentage infestation on a nearby untreated peach at 98 per cent. Out of a total of 996 fruits harvested, only 66, or 6.63 per cent. were infested with fruit fly maggots, whilst sixty-two fruit flies were collected from the cleared space beneath the tree during the experimental period.

Effect of Bait Spray on Other Insects.

Throughout these experiments one of the most notable features has been the large numbers of other insects, especially flies of all sorts which have been brought down by bait sprays containing nicotine.

Amongst the flies collected were brown and green blowflies, metallic tomato flies, houseflies, flesh flies and occasional syrphid (hover) flies. Of the ladybirds brought down these were mostly fungus-eating *Leptothea*, and occasional *Cryptolaemus* and *Leis conformis*.

Effect of Temperature and Wind on Fly Activity.

During the course of these experiments it has become increasingly evident that fly infestation in individual backyard trees occurs principally as a result of attack by flies developed in the vicinity, and which are attracted into the tree, often in numbers, when conditions are favourable. Such flies on arriving in the trees are very active, aggressive and are powerfully stimulated to lay eggs, and generally lose no time in

doing so. Temperatures in the vicinity of at least 70 deg. Fahr. appear to be necessary to stimulate flies to respond to the attraction of ripening fruits, and possibly such temperatures may also play a part in increasing odours given off by such fruits.

Evidence has been seen of the effect of wind in apparently carrying attractive odours towards flies some distance away. This was particularly marked on 6th December, 1947. During the morning frequent inspections were made, but no flies were found up to 11 a.m. At this time a gentle north-east breeze sprang up and within a short time flies commenced to come down, practically all falling within the same area on the south-west quarter of the tree. These flies apparently travelled up-wind towards the source of the attraction and contacted bait on the south-west corner of the tree. Though not so strikingly illustrated, this same feature has been noted at other times and it may be made use of to advantage under orchard conditions by more frequent baiting on outside trees on the side opposite the direction of the prevailing winds.

Whilst light breezes may cause flies to move up-wind, strong winds are not favourable for fly movement, and very little migration appears to occur whilst such winds are blowing. It has been noted, however, that when a lull occurs after heavy winds, flies often move into the trees in considerable numbers, possibly following an odour train created by such winds.

Not all days are suitable for fly migration but there may be short periods of an hour or so on otherwise unfavourable days when flies may move into the tree. This makes it essential that protective measures be functioning continuously throughout the susceptible period.

To Make the Bait.

It is not known how long a nicotine-sugar bait remains toxic to flies under ordinary field conditions, though in the 1944 trial bait applied on 5th December, 1944, was still bringing down flies five days later. Bait residue much older than this has been seen to be still toxic to flies provided rain has not fallen on it. However, the aim should be to ensure that a supply of readily acceptable bait is constantly available on the tree throughout the susceptible period, and especially as the fruit becomes more attractive; a little bait should be put on at least every couple of days, and more often if rain falls.

Half a pint of bait is sufficient for an average-sized tree, but it should be applied so that it is as well distributed over the tree as possible. Flicking the bait on with a brush is a simple and more economical way than using a spray pump and the operation should not require more than a few minutes per tree.

A convenient method of making up the bait is to mix two small teaspoonfuls of nicotine sulphate (Blackleaf 40) in half a gallon of water in which four level tablespoons of white sugar have been dissolved. This solution should be placed in a tightly stoppered container marked "POISON." For each baiting, half a pint of this solution is taken and half a teaspoonful of 20 per cent. DDT emulsion is stirred in. This mixture should then be used straight away.

Treatment should commence from 4-6 weeks before the fruit is expected to ripen, and a guide to the proper time to commence may be obtained by placing a glass fruit-fly trap baited with a suitable lure in the tree, and inspecting it daily for the presence of fruit flies.

During the past season this bait spray was used with considerable success by a number of householders in the metropolitan area who had previously been unable to obtain clean fruit, whilst neighbouring trees were heavily infested.

Mr. H. Parry Brown, Chief of the Division of Information and Extension Services of the Department, kept careful records of results obtained on a Shanghai seedling peach tree growing in his Roseville garden and reported that whereas in five previous seasons he had not been able to harvest any clean fruit, he was able to secure 87 per cent. of the crop of 600 peaches following the use of nicotine-DDT-sugar bait spray. A nearby Blackburn peach not treated with this material had about 74 per cent. of the total crop infested.

References.

[1] Allman S.L. *J.Aust.Inst.Agr.Sci.* 6:40-44, 1940.

[2] ——— *Agr. Gaz. N.S.W.* 52:281-282, 1941.

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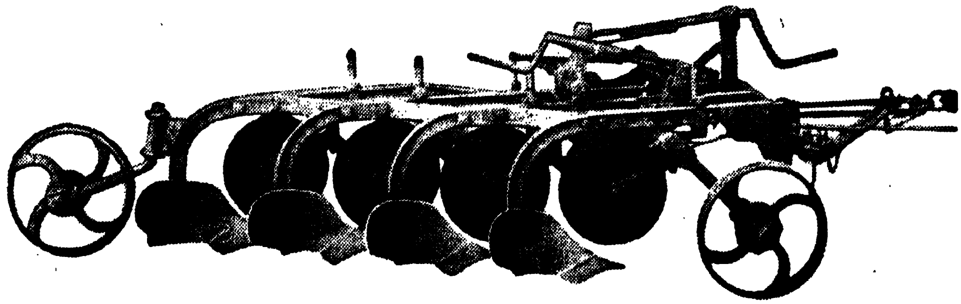

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INSECT PESTS.
Notes contributed by the Entomological branch.

Insects and Other Pests of Mushrooms

CULTIVATED mushrooms are attacked by various insects, mites, woodlice, slugs, rats and mice.

The most important pests, however, are the mushroom flies or fungus gnats (*Sciara* sp.), the springtails (*Hypogastrura armata* and *Onychiurus ambulans*). A tyroglyphid mite commonly responsible for injury to mushrooms in this State is *Tyrophagus putrescentiae*.

The minor pests of most importance are manure flies (*Phoridae*), the tyroglyphid mites (*Caloglyphus* sp., and *Histiostoma* sp.). A species of tarsonemid mite (*Pigmaeophorus* sp.) has been found in mushroom beds in the Sydney district, and on occasions appears to have seriously reduced the anticipated yield. Slaters, at times, may also cause considerable injury.

Principal Pests of Mushrooms.

Mushroom Flies or Fungus Gnats.

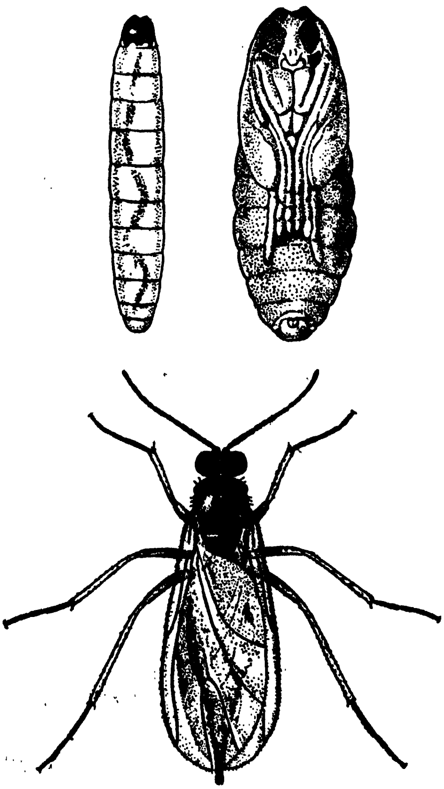
These flies, which measure about ⅛ inch in length, are the commonest pest of the mushroom crop. They are slender, dark brown to black insects, with long legs and wings. They fly readily when disturbed, but are usually content to run over the surface of the beds and the manure, or the walls of the mushroom house.

The eggs are extremely small, white or yellowish, and oval in outline. They are laid on the manure, casing soil or mushrooms and hatch in four to six days.

The maggots or larvae, which measure about ¼ inch in length when fully-fed, have whitish or transparent bodies and distinct black heads. After feeding for about ten to fourteen days, the maggot spins a thin silken cocoon in the soil or manure, and within this enters its pupal stage. Later, after about four to seven days, the adult fly emerges.

Egg-laying may commence within twenty-four hours of emergence, and an individual female fly may lay from 200 to 300 eggs.

The maggots feed upon the mycelium within the beds, or upon the mushrooms. Where the mushrooms are attacked, the larvae bore into the tissues, forming narrow



Mushroom Fly.
Above.—Larva and Pupa. *Below.*—Adult.
[*After Davis.*

galleries which may extend from the base of the stem up to the cap, and the interior may become honeycombed. Small mushrooms, just breaking through the soil, may also be attacked by the larvae, and as a result may turn brown. This is due to the larvae feeding within and hollowing out the buttons as they appear above the surface. Further development of the buttons is thus prevented, and sometimes a whole crop may be lost in this way.

Although no direct damage is caused by the adults, they may be responsible for spreading mites from infested beds to clean ones.

Springtails.

Springtails are primitive wingless insects which have derived their popular name from their habit of springing into the air. Not all species, however, possess a spring.

Several species of springtails attack mushrooms, or occur in the compost.

The adult insects, which measure about 1-25th inch in length, are whitish, bluish, or grey. They move slowly over the surface of the beds, or may frequently be seen in numbers, resting on a mushroom cap. When disturbed, they project themselves several inches into the air by means of a special organ or spring situated on the undersurface of the body at the end of the abdomen.

Mushroom Springtail.
[*After Thomas.*

They usually feed in manure or other decaying organic matter, particularly where dark, damp conditions prevail, and become pests where conditions, such as are found in mushroom beds, suit rapid development.

Their minute spherical eggs, which are semi-transparent, are deposited in small groups on, or in, the bedding manure, on casing soil, or even on the bases of mushroom stems. The young springtails resemble the adults in general form and during growth cast their skins at intervals until they reach the adult stage. Immature and adult forms may be found feeding together.

The mycelium or newly planted spawn pieces may be destroyed, and where the caps are attacked the mushrooms may become unmarketable owing to the honeycombing and pitting caused by the feeding of the springtails. Occasionally replanting becomes necessary.

Mushroom Mites.

Both injurious and useful predatory mites occur in mushroom beds. The beneficial species are very active, and may thus be readily distinguished from the injurious mites which are sluggish.

Tyroglyphid mites occur almost everywhere, and are by no means confined to mushrooms as many growers believe. They may be found in decaying humus, manure, rotting timber, rotting fruit and many foodstuffs, including cheese, and they are widespread in Australia.

The tyroglyphid mites, which measure less than 1-25th inch in length when adult, are pearly-white to yellowish-white.

The female deposits whitish, oval eggs on the manure, on the casing soil or on the mushrooms. These eggs hatch into minute six-legged larvae, which cast their skins within a few days and enter their first nymphal stage, in which they have eight legs, and resemble the adults. After feeding for some days they again cast their skins and enter their second nymphal stage. These nymphs, after feeding for several more days, again cast their skins and become adults.

Tyroglyphid mites may also develop into an additional non-feeding stage, known as the hypopal stage. This stage develops between the first and second nymphal stages. The hypopal mite bears several sucking-discs beneath its body, and by means of these it is able to attach itself to various insects, clothing, baskets, etc. This form, which

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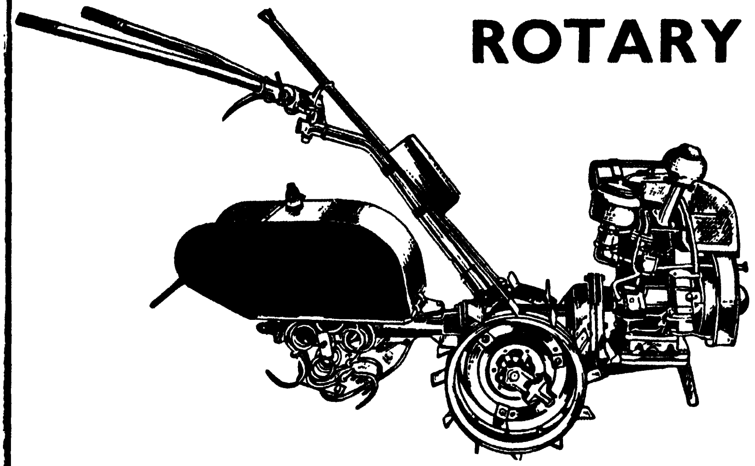

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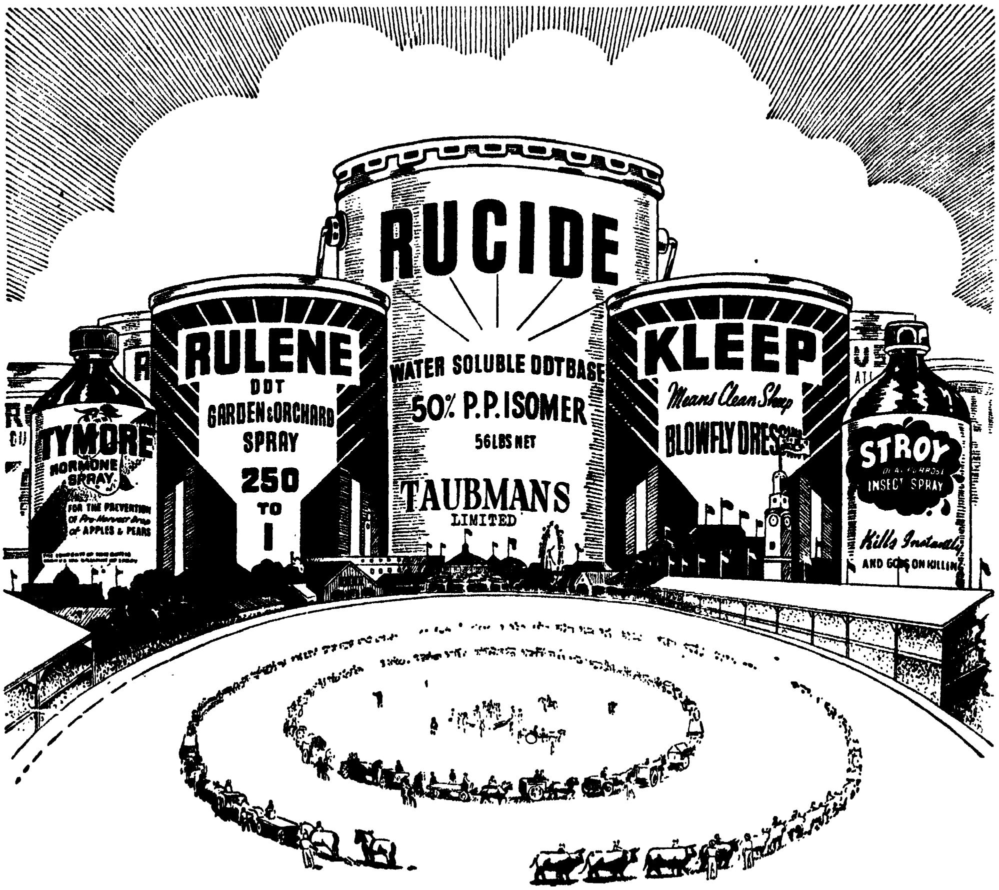

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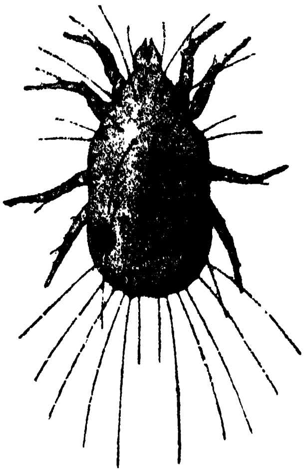
can withstand adverse environmental conditions, assists both in the distribution of the mite, and maintenance of an infestation. When favourable conditions are experienced after detachment, the hypopal mite changes into the second nymphal stage and later into the adult.



Mushroom Mite.

Mushroom mites may eat the mycelium of newly-planted spawn pieces and destroy them in a similar manner to springtails, but more serious damage is caused when the caps and stems are attacked. When feeding on the latter, the mites cause dark, slimy holes to appear, or where the mushrooms are small, they may be completely hollowed out and contain great colonies of mites and their eggs.

Minor Pests.

Manure Flies.

The damage caused by these flies is very similar to that of the mushroom fly. Although these flies, at times, may occur in large numbers in the mushroom house, the amount of damage they cause is not usually extensive.

The adult, which is about the same size as the mushroom fly, is heavier bodied and very active. It is dark brown or black.

The eggs are laid on or in the manure and on the casing soil, or on mushrooms and between the gills. The larva or maggot, which is whitish, tapers towards the head end, and has not the black head seen in the mushroom fly. They pass their pupal stage either in spawn pieces or the manure, or in the casing soil.

The larvae or maggots may attack the mycelium of the spawn pieces, or they may bore into the stems and caps. Where the latter injury occurs, the mushrooms may be completely honeycombed, without showing much external evidence of attack.

Control.

In most years, where mushrooms are produced in seasons when the temperature is seldom above 60 deg. Fahr., insect and mite pests seldom cause extensive damage, providing the compost has been correctly prepared.

However, when they are grown in the warmer periods of the year and high temperatures prevail, insects and mites frequently become injurious and may even prevent production.

Once mushroom beds become infested with insects and mites it is practically impossible to control them, for all these pests feed, not only on the mushrooms, but also upon the mycelium within the beds.

For many years attempts have been made to devise means whereby insects and mites may be prevented from becoming established in mushroom beds, and it is now accepted that every precaution should be taken to prevent the appearance of the pests in the beds by correct composting and sanitary measures. However, despite normal precautions mushroom pests frequently appear and serious damage results, especially when temperatures above 65 deg. Fahr. are experienced.

Partial control of insects and mites may be achieved by the judicious use of nicotine sulphate or kerosene-pyrethrum sprays, and fumigation with sulphur, and some growers have greatly reduced the populations of adult flies within their mushroom houses, by applying DDT residual sprays to surfaces where the flies congregate.

Extreme precautions, however, should be taken in the use of sprays containing kerosene or similar solvents, as malformed mushrooms may develop following the treatment of beds with these types of sprays.

In recent years, some growers have been using blowlamps to reduce infestations of mites and springtails, but serious damage,

to both mushrooms and mycelium, may occur unless the beds are flamed over correctly.

In view of the difficulties experienced in endeavouring to control mushroom pests by the usual methods, an attempt was made to combat them by mixing into the compost a substance which would be toxic to the pests, but non-injurious to the mushrooms and mycelium.

Preliminary investigation has indicated that BHC (benzene hexachloride) will prevent the pests from developing to plague numbers, and although this chemical possesses a characteristic musty odour, the mushrooms from treated beds appear to be untainted.*

It must be stressed here, however, that the preparation of the compost is of great importance.

The compost is best prepared on a concrete or wooden floor, as it is then not so readily infested from surrounding areas. If, however, the compost must be prepared on the ground surface, the site should be thoroughly cleaned up beforehand. The removal of the top 2 or 3 inches of soil would be an advantage, and as a further precaution a steam jet may be run over the ground surface to kill any insects or mites present. Where this is impracticable the treatment of the surface with boiling water or spraying it with formalin would be of definite value.

Dusting the soil with 10 per cent. BHC, at the rate of 2 oz. per 6 square yards, would be quite as effective.

When the compost is being prepared in the open, and subsequent fumigation of the beds cannot be practised, the treatment of the surface of the heap with a steam jet, spraying with nicotine sulphate (1 fluid oz. to 4 gallons of water) or dusting with a pyrethrum dust containing 60 per cent. pyrethrum powder and 40 per cent. kaolin will help to keep the insects in check.

If the compost is to be laid down in beds in properly constructed mushroom houses or rooms. the latter should be cleaned and fumigated before the compost is placed in the beds, and again when the beds reach the highest temperature, or "peak heat," after being laid down. The beds should not, however, be fumigated, especially with sulphur, after the spawn has been planted.

Satisfactory fumigation can only be effected when the mushroom houses, sheds or rooms can be made reasonably gas-tight. In the United States, burning sulphur is said to be gradually replacing hydrocyanic acid gas, because it is cheaper and has the double value of being both an insecticide and fungicide. Hydrocyanic acid gas is, moreover, very poisonous and should only be handled by those skilled in the process of fumigating with it.

Calcium cyanide is the material recommended for the generation of hydrocyanic acid gas, and is used at the rate of 1 lb. per 1,000 cubic feet of air space. Burning sulphur is used at the rate of 2 lb. per 1,000 cubic feet of air space. In each case the duration of the fumigation should be about six hours.

After the spawn has been planted, insecticides in liquid or dust form may be used as a routine practice, every three days, to keep the insects in check.

The nicotine sulphate spray should be applied as a fine mist over the beds. A kerosene pyrethrum fly spray may be employed instead of nicotine sulphate, but if this is used in other than a fine mist the mushrooms may be injured.

The pyrethrum-kaolin dust should be applied with a hand-dusting machine, but heavy dusting of the caps with this mixture may leave a yellowish stain, particularly when the caps are wet.

These treatments are best applied at three-day intervals, and in each case after the marketable mushrooms have been picked.

Trapping the adult flies is a useful auxiliary method to dusting or spraying. An electric light or lantern is placed immediately over a shallow pan containing water and a little kerosene. Large numbers of flies are attracted to the light and fall into the oil and water. Sticky papers are employed for the same purpose.

Attention to general hygiene is always necessary. Areas surrounding compost heaps and manure beds should be kept clean and sprayed occasionally with kerosene or other volatile oil and sprinkled with hydrated lime, or dusted with 10 per cent. BHC.

* Shanahan G. J., 1948 *Agricultural Gazette* N.S.W., LIX: 185.

Sites where beds are established should always be thoroughly cleaned both before the beds are laid down and after cropping has been completed. Overgrown mushrooms, waste stalks or infested mushrooms should be burnt, and used manure or manure in course of preparation should be kept well away from newly-established beds.

Treatment of Compost with BHC.

The population of mushroom mites, flies and springtails, within the beds can be practically eliminated and maintained at a low level by incorporating 10 per cent. BHC dust into the compost, at the rate of 3 lb. of BHC per ton of compost.

Since the relatively high temperatures produced during composting may affect the efficiency of the BHC, the dust should be added to the compost just before it is placed into the beds. Where growers use ridge beds, it will be perhaps more convenient to add the BHC to the compost before the beds are made. If flat beds are adopted, then the dust may be added either before or after the beds have been laid down.

A satisfactory distribution of the dust, throughout the compost, is obtained if two or three equal quantities of the dust are lightly scattered over the compost which is then turned after each application of dust.

Treatment of Casing Soil with BHC.

Mushroom and manure flies may be considerably reduced in numbers by dusting the surface of the casing soil with 10 per cent. BHC dust, at the rate of 3lb. to 1,000 square feet of bed. The dust may be evenly applied by means of a tin with a perforated lid. A nut or similar heavy object in the tin will assist in giving a more complete cover. Treatment can be made either before or after watering. A flush of mushrooms, which is being attacked by mites or springtails, can be partially saved by the surface dusting treatment mentioned above. However, where either mites or springtails are prevalent within a bed, the surface treatment will not control them and they will continue to destroy the mycelium and may eventually prevent production.

Further investigations will decide whether water dispersible BHC can be watered into the beds to control the pests within the beds.

If mites or springtails are attacking the spawn pieces apply a small quantity of BHC dust around plantings.

It is advisable to dust the pathways with BHC dust at intervals.

Other Pests of Mushrooms.

Slaters or Woodlice.

Under certain conditions these crustaceans may become numerous enough in the beds to cause appreciable injury. They mainly frequent damp places as they breathe by means of gills which must be kept moist.

They often shelter between the boards supporting the beds and the manure, and may also occur in large numbers in the manure beds, where they feed on the manure and mycelium therein. When they attack mushrooms, large clean holes may appear in the caps and stems, due to their feeding.

Mass of Slaters or Wood Lice.

Control.—A contact dust which is recommended for the control of slaters consists of a mixture of pyrethrum powder 1 lb., and kaolin 4 lb.

The beds may be treated lightly with this dust without injury to young mushrooms. The dust should also be blown into crevices and hiding places likely to harbour the slaters.

Satisfactory control of slaters may also be obtained with a mixture of metaldehyde and bran. The formula for this bait is: Metaldehyde (finely powdered), 1-3rd oz., bran 1 lb., water 1 pint. The metaldehyde and bran are first mixed together dry and then made into a crumbly mash with the water. The bait is placed in small heaps

(Continued on page 168.)

The Farmer's Library

Reviews of Books of Interest to Farmer and Students.

Crop Management and Soil Conservation.

BY

JOSEPH F. COX AND HYMAN E. JACKSON.

THE second edition of this book, published 1948, contains thirty-four chapters, divided into two parts.

Much of the first half of Part I appears to be more suitable as a text-book of general agricultural knowledge for the use of teachers and students than as a guide to farmers, and though the second half of Part I deals in a general way with aspects of crop production, the matter is handled necessarily rather superficially in the space given, with emphasis still on use by students.

Part II covers the main ground in crop management for several of the main crops and pastures, in such a way as to be of value to students who wish to obtain a superficial general knowledge of the many aspects of crop production and management, under American conditions.

A very limited amount of space is given to soil conservation even though the main aspects are dealt with.

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[*Review by H. Wenholz.*]

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The material is based almost entirely on records in vols. 15 to 17 of Plant Breeding Abstracts; references are quoted, together with the names and addresses of the institutions and organisations from which further information may be obtained.

Australia's contributions are restricted to several wheat varieties, with one flax and one cotton entry.

This publication (Seventh issue, 1948) issued by Commonwealth Bureau of Plant Breeding and Genetics, is obtainable from technical book shops or from the C.A.B. Liaison Officer, 314 Albert-street, East Melbourne, C.2. Price 3s. 2d.

[*Review by H. C. Trumble.*]

"SUNRAYSIA—A Social Survey of a Dried Fruit Area."

By A. J. MCINTYRE.

THIS social survey (published 1948) is the third in a series carried out by research workers of the Melbourne University School of Agriculture and will appeal to all those who are interested in the development of a stable and prosperous rural population in Australia. The survey gives a fairly comprehensive account of the social and economic conditions of 150 out of a total of 1,615 "representative" growers at the time of the

(Continued on page 157.)

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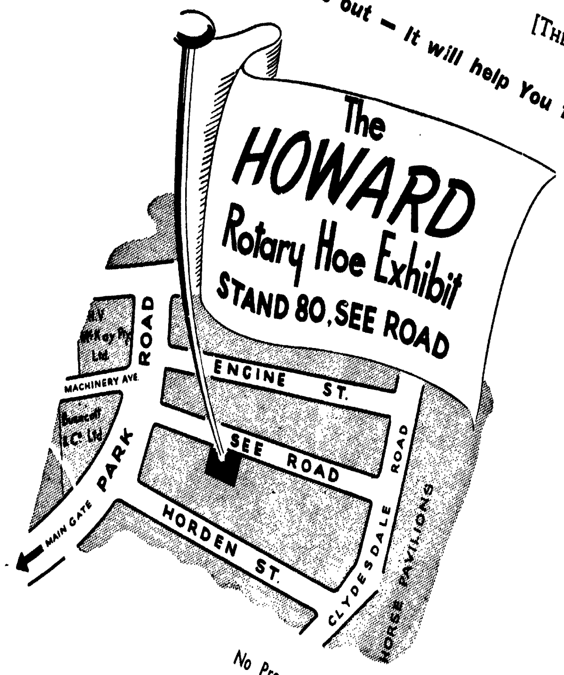

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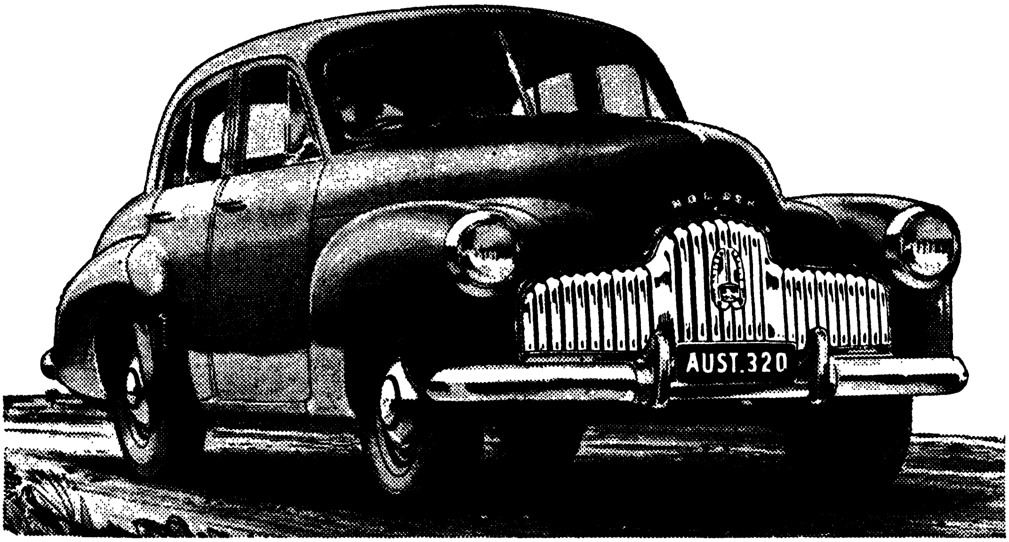

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A Specimen

DAIRY SHAREFARMING AGREEMENT*

THE specimen dairy sharefarming agreement set out below has been drawn up by the Department of Agriculture for the guidance of both owners and sharefarmers. It is designed to ensure an equitable return to each from the working of the property, and to enable the adoption of methods of soil and animal husbandry that will maintain the fertility of the soil and the productive capacity of the herd.

Date and Name of Parties.

AGREEMENT made the..........................day of..........................19......
between..........................of.......................... in the State of New South Wales (hereinafter called the owner) of the one part, and.......................... ....of..........................in the State of..........................(hereinafter called the sharefarmer) of the other part.

Description of Land.

The owner, in consideration of the agreements set forth in this agreement to be kept and performed by the sharefarmer, agrees to allow the sharefarmer to work all that piece or parcel of land of approximately ....acres, being portion No.........................., parish of.......................... county of ....

in the State of New South Wales, and the quantities and particulars of which are (more or less) set forth in the First Schedule hereto, together with the appurtenances and all fixtures and fittings thereon, except those specified in the Second Schedule hereto which are to be regarded as fixtures belonging to the sharefarmer, and in respect of which Section 21 of the Agricultural Holdings Act is to apply.

Duration of the Agreement.

The Agreement shall commence on..........................and shall remain in force :—

(a) as an agreement terminable at the will of either party or his executors, administrators and assigns, by at least twelve (12) months' notice in writing expiring on the anniversary of the commencement of the agreement as required by the Agricultural Holdings Act, 1941;

(b) for a period of ....years and thereafter from year to year unless and until terminated by at least twelve months' notice in writing expiring on the anniversary of the commencement of the agreement as required by the Agricultural Holdings Act, 1941.

Extent of Agreement.

This agreement shall be binding on the heirs, executors, administrators and assigns of both owner and sharefarmer in like manner as upon the original parties, except by mutual agreement otherwise.

No Partnership Created.

This agreement shall not be construed as giving rise to a partnership, and neither party shall be liable for debts or obligations incurred by the other without written consent.

The Owner Agrees.

(1) to supply the above described farm, including improvements thereon;

(2) to supply material necessary for repairs and improvements on above described farm, such materials to be delivered on the farm;

(3) to supply skilled labour employed in making permanent improvements and major repairs such as are necessary after fires, floods and cyclones;

(4) to pay taxes and insurance on the above described property;

(5) to furnish..........................dairy cows and..........................registered dairy bulls, but the number of such dairy cows shall not be reduced below.......................... except by mutual agreement. Such stipulated number of dairy cows shall be in-calf cows or heifers.

(6) to furnish..........................brood sows and ....boars, but the number of such sows shall not be reduced below..........................except by mutual agreement.

(7) to furnish all horses and plant, as listed in the inventory of the New South Wales Department of Agriculture's Dairy Farm Record Book, being kept in pursuance of this agreement, and as are necessary to properly operate the farm as described above;

*Any provision in this Agreement which the parties do not wish to become a part of their contract, should be crossed out in ink identically on all copies of the Agreement.

(8) to provide all other farm expenses, equipment and labour, except as provided in the section the sharefarmer agrees,

(9) to compensate the sharefarmer for the control of noxious weeds and animals on the farm, payment to be as follows :—

(10) to allow the sharefarmer the sum of........................for each calf reared for replacements in the herd;

(11) to pay the sharefarmer's share of milk or cream cheques without any unauthorised deduction direct into the sharefarmer's Banking Account, or direct to the sharefarmer, accompanied by a copy of the Monthly Statement within three days of receipt of the money;

(12) to pay the sharefarmer's share of money due from the sale of pigs, together with a statement of sales, by the 25th of the month following the sale of same;

(13) to make repairs and erect new buildings as may be required by an Inspector under Acts dealing with the production of milk and cream;

(14) to pay all Herd Recording Fees;

(15) to provide lime or paint and tar or bitumen paint for painting of dairy premises once yearly;

(16) to provide a lavatory within reasonable distance of bails ;

(17) to keep boundary fences in good order;

(18) to allow the sharefarmer to graze........................horses for his own use free of cost;

(19) to allow the sharefarmer to take not more than........................quarts of milk daily from the undivided product for use in the farm household;

(20) to allow the sharefarmer to have whatever produce of the orchard and garden, including potatoes, is used in the farm household, but not more than........................acres shall be used for the said orchard, garden and potatoes;

(21) to allow the sharefarmer to keep all the income from poultry and eggs provided that not more than........................head are kept;

(22) to provide a house rent free for the sharefarmer, such house to be provided with a bath-room and bath, and laundry facilities;

(23) that there shall be no reduction during the period of this agreement, of the area available to the herd, except by mutual agreement in writing;

(24) to provide an adequate water supply for stock and house-hold purposes, and to pay all costs in connection with the pumping of water;

(25) to supply all medicines and veterinary services, necessary for the health of the stock;

(26) to insure the sharefarmer and other workers employed by the owner against any claims under the Workers' Compensation Act, and its amendments, throughout the term of this agreement.

(27) Additional items :—........................

The Sharefarmer Agrees.

(1) to provide labour to operate the farm in a manner conforming to the rules of good husbandry;

(2) to provide labour for repairs, except skilled labour;

(3) to keep, with the assistance of the owner, a strict financial record of the farm business in the New South Wales Department of Agriculture's Dairy Farm Record Book. The record shall include a careful Annual Inventory of land, improvements, livestock, grain, supplies, machinery and equipment owned by the owner of the farm, and a complete account of the purchases and sales of the farm business;

(4) to supply a report of farming operations to the owner on forms provided by the owner, on or before the........................day of each month;

(5) to faithfully do all farm work in season and in a manner conforming to the rules of good husbandry;

(6) to milk the cows twice daily at times mutually agreed upon;

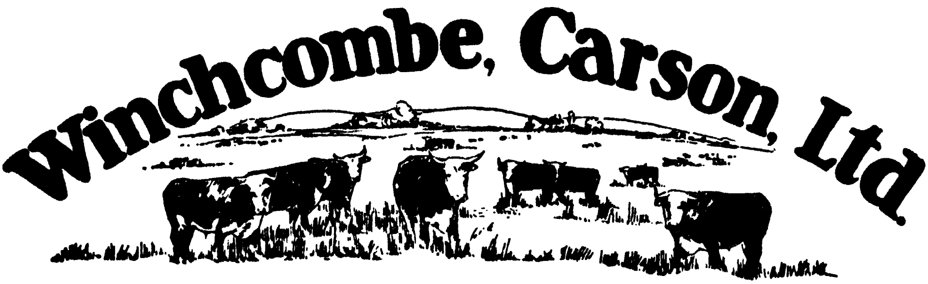
(7) to deliver the milk or cream at........................for transmission to the........................ ....dairy factory at........................;

(8) to care for all livestock and crops in a manner conforming to the standards of good husbandry;

(9) to report promptly to the owner all cases of illness or disease in the livestock;

(10) to take all reasonable care to prevent the spread or introduction of noxious weeds in compliance with State laws and local regulations (see provisions under "The Owner agrees");

(11) to take all reasonable steps to keep the farm free of noxious animals (see provision under "The Owner Agrees");



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Bourke, Armidale

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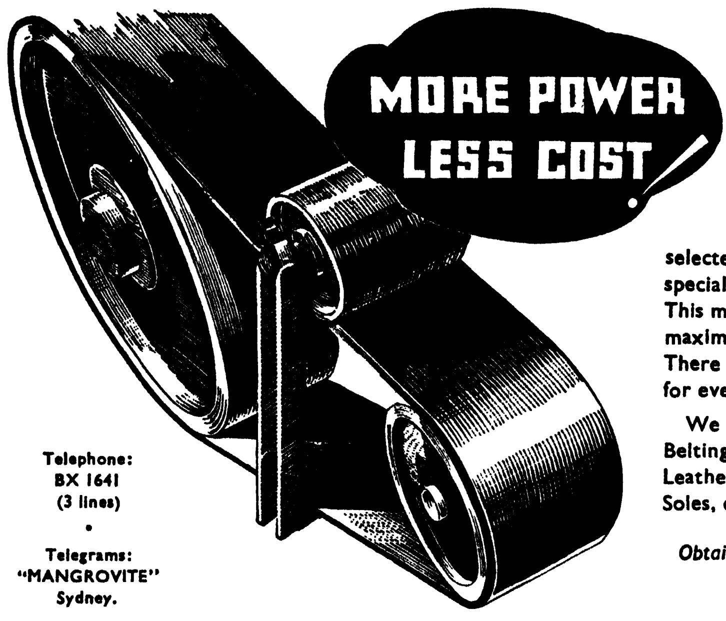

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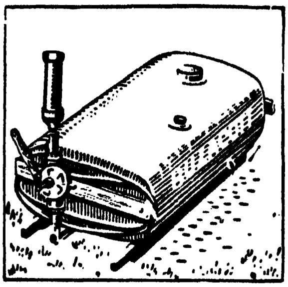
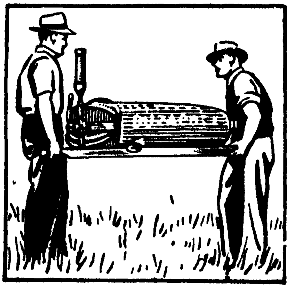


SELF-CONTAINED

Units are of 90 gal. or 190 gal. size, and include self-priming, semi-rotary pump, 30 feet of hose and nozzle. Tank is mounted in hardwood frame, bolted and fitted with carrying handles.

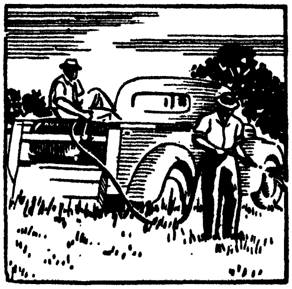


EASILY PORTABLE

Tanks are of aluminium, baffled both ways, and covered with fire-proof rubber and canvas.

The smaller unit weighs 2 cwt. when empty and fits a utility truck.

The 190 gal. size weighs 3 cwt. and is designed for a truck.



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No splashing away of water is possible as the tank is well baffled.

The pump will throw a jet 30 feet from the nozzle or provide a fine spray when required.

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190 gal. size complete	£25	Tank Bare...	£19

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(12) to keep the buildings, fences, plant, utensils and other improvements on said premises in as good repair and condition as they are when he takes possession, or in as good repair and condition as they may be put in by the owner during the term of the agreement, ordinary wear, loss by fire and flood, or unavoidable destruction excepted;

(13) to put up and take down and preserve for future use such temporary fences as are necessary for the grazing and cultivation of the fields;

(14) to have and distribute to the fields all manure made on the farm, at times mutually agreed upon;

(15) to rear such calves as are required for replacement purposes up to 25 per cent. of the herd or as agreed up to an age of six months or as otherwise agreed;

(16) to consign pigs when fit to..........................factory, or as mutually agreed;

(17) that he will comply with the provisions of all Acts relating to the sanitation of the dairy premises and utensils;

(18) to whitewash or paint and tar or bitumen paint the dairy premises at least once every 12 months (see " Owner agrees ");

(19) to keep all stray and strange stock off the said land;

(20) not to assign or sublet this agreement to any person or persons, without the written consent of the owner;

(21) on termination of this agreement to vacate the house and farm property;

(22) to take proper care of all trees, vines and shrubs, and to prevent injury to same;

(23) not to cut live trees except by permission of the owner, but to use only dead or down timber not suitable for saw logs or posts;

(24) that when milking machines are provided by the owner to keep all rubberware in good order and replace when necessary;

(25) to provide fuel (kerosene, petrol and oil) or electric power necessary to operate the following :—

....

....

....

....

(26) to provide brooms, scrubbing brushes and cleaning compounds required in the dairy;

(27) to provide board for the Herd Recorder;

(28) to insure, and keep insured the workers employed by him against any claims under the Workers' Compensation Act and its amendments, throughout the term of this agreement;

(29) not to do work off the farm except in exchange for equal work on the farm, or otherwise as agreed upon;

(30) Additional Items :—..

....

....

Each Party Agrees.

(1) that all milk and cream, pigs and other produce of the said land shall be consigned for sale in the name of the owner;

(2) that the owner shall receive..........................shillings in the pound and the sharefarmer ....shillings in the pound of the sum derived from the sale of milk or cream, after deducting factory and carting charges ;

(3) that the proceeds from the sale of crops or portion thereof, shall be divided as follows :—..........

....

....

(4) to dispose of all calves not required for replacements and to divide the proceeds as follows, after first deducting the expenses of consigning..

....

....

(5) to consign pigs, when fit, to..........................Factory or as otherwise agreed upon, and the proceeds from such pig sales shall be divided as follows, after first deducting the expenses of consigning..

....

....

(6) that in the event of land preparation for cropping, sowing, cultivation, and/or harvesting being carried out by contract, the cost to be borne wholly by the sharefarmer unless otherwise mutually agreed;

(7) that the costs of all seeds of lucerne, grasses, and clovers for permanent pastures shall be borne ....by the owner or..........................by the owner and..........................by the sharefarmer;

(8) that the costs of all fertilisers and lime to be used in the establishment of lucerne grasses and clovers shall be borne..........................by the owner, or.........................., by the owner and..........................by the sharefarmer;

(9) that the costs of seeds and fertilisers for annual crops shall be borne................ by the owner, or................by the owner and................ by the sharefarmer;

(10) that the costs of repairs to farm machinery and harness belonging to the owner shall be borne by the owner;

(11) that the costs of repairs to machinery and harness belonging to the sharefarmer shall be borne by the sharefarmer;

(12) that extra labour required for hay and silage making for the herd shall be provided equally by both parties;

(13) that on quitting the farm at the termination of his agreement, the sharefarmer shall, in addition to any rights to compensation for various items to which he may be entitled under the Agricultural Holdings Act, 1941, be entitled to compensation for the value of his share of—

(*a*) land cultivated and prepared by the sharefarmer for cropping,
(*b*) standing crops,
(*c*) fodder stored on farm for feed or sale,
(*d*) pigs in hand at termination of agreement,
(*e*) shares of Government subsidies and factory bonuses still to be paid. Deferred pay;

(14) that all leguminous seeds shall be inoculated with a culture prepared by the Department of Agriculture, the owner to pay the cost of the culture and the sharefarmer to inoculate the seed as per instructions supplied by the Department of Agriculture;

(15) that all plant when not in use, shall be placed in sheds provided for that purpose by the owner;

(16) Additional Items:—..
....
....

Cropping System:

(1) The parties agree that the main crop rotation, system of cultivation, and pastures management, shall have regard to advice from the various authorities concerned in the Department of Agriculture, and that in planning the crop rotation, and management of pastures, regard shall be given to soil conservation and maintenance of soil fertility. The crop rotation shall be as follows: ....
....
....
....

(2) when any crop fails, the parties shall agree on the crop to be substituted. Each year this agreement remains in effect, the two parties shall agree in writing upon the cropping system to be followed, and that agreement shall become part of the agreement.

Arbitration.

If any dispute or controversy should arise between the parties touching the Agreement, or the rights and liabilities of the parties thereunder (not being a dispute referable to arbitration under the Agricultural Holdings Act, 1941) then in every such case the matter in dispute shall be referred to arbitration under the provisions of the Arbitration Act, 1902, or any Act amending or replacing the same.

Owners Right to Entry.

The said owner reserves the right of himself, his employees, assigns, prospective buyers, to enter upon said premises at all reasonable times for any purpose not inconsistent with the rights of the sharefarmer under this agreement.

Additional Agreements. ....
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....

Signatures.	*Witness.*
................................Owner.	....
................................Sharefarmer.	....

THE FIRST SCHEDULE.

Name, Number, or Description of Paddock.	Area.	Pasture.	Arable.

THE SECOND SCHEDULE.

Every article or thing fixed on the premises not specified in this schedule belong to the Owner.

Reviews of Books of Interest to Farmer and Students.

(*Continued from page* 152.)

survey (November, 1943, to July, 1944). It must be remembered, however, that growers constitute only a fraction of the area's breadwinning population. Before it can be claimed that the survey covers the whole dried fruits area, containing 25,000 people, further investigation into the lives and livelihood of the remaining breadwinners is needed.

In a condensed historical account the author has traced the development of the area from the first recorded settlement by white people in 1846 to the thriving communities of a century later when Dried Fruits Boards, set up in each producing State in 1923 to determine and enforce export quotas, have combined with the Australian Dried Fruits Association and the Commonwealth Dried Fruits Control Board to attain a large measure of security in the marketing of its products.

The survey itself is classified as follows: Fruit-growers' holdings, financial status, population analysis, work and workers, homes, towns and transport, health and food, education, leisure, satisfaction and prospects, with a summary and conclusion.

[Published by Melbourne University Press. Our copy from the author.]

THE amount of grain sorghum grown in this State, for which export permits will be granted is 50 per cent. of the grain sorghum production for the year 1948-49, irrespective of the quantity, but subject to consultation with the Commonwealth Department of Commerce and Agriculture.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Evans, C. A. & Sons, "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury, Agricultural College, Richmond (Jerseys)	107
Hicks Bros. "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	53
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Stud Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H. "Turanville," Scone (Polled Beef Shorthorns)	114
Rowntree, E. S., "Mourabee," Quirindi...	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm...	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale .	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry

Australian Wheats Praised by Dr. Kent-Jones.

DR. KENT-JONES, British world authority on wheat, flour and baking problems, who visited Australia in 1947 to investigate local problems, has now submitted an interesting report on the quality of some of the wheats that gained prizes at the Sydney Royal Agricultural Show that year. After analysing these wheats and determining the stability and strength of their flour, Dr. Kent-Jones said that some of them were better than top-grade Manitoba wheat. Cailloux, Charter, Yalta and Gabo were found to be exceptionally strong wheats, with well-balanced doughs. In English blends these wheats, said Dr. Kent-Jones, would be more useful than top-grade Manitoba and would carry weaker wheats better than the Canadian types.

He said that all samples were of exceptionally good appearance, and that New South Wales was to be congratulated on being able to produce wheats of this type regularly and in quantity. In Australia, bakers were pleased with the quality of flour being milled from Gabo, a variety bred by Professor W. L. Waterhouse, of Sydney University.

A small quantity of flour, milled from Gabo, grown in the Forbes (central New South Wales) district, was used to produce bread for show purposes. In open competition, the Gabo bread gained a State championship, two firsts, nine seconds and seven third prizes. Gabo had never previously been baked commercially, and this was the first time on record that flour from a single wheat had been used to produce bread for show purposes.—Abstracted in "Field Crop Abstracts" from *London Corn Circular,* May, 1948.

THE Commonwealth Department of Commerce and Agriculture has approved of pears being exported to the United Kingdom this season in the standard apple box (internal dimensions 18 inches x 10½ inches x 11½ inches), on condition that this box is acceptable to receivers of the pears.

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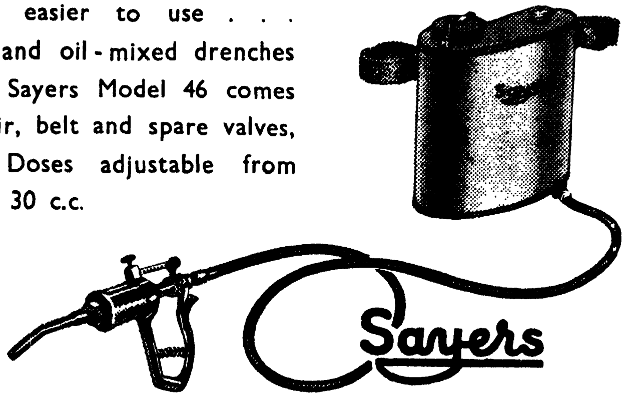
It's automatic, faster, easier to use . . . suitable for all water and oil-mixed drenches except Phenothiazine. Sayers Model 46 comes complete with reservoir, belt and spare valves, seats and springs. Doses adjustable from 5 to 30 c.c.

1 OZ. AUTOMATIC DRENCHING GUN



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THE *NEW* "PHENOVIS" POWDER

★ Mixes easily.
★ Forms a stable fluid suspension.
★ Flows easily through any drenching gun.
★ Ensures the most accurate dosing of stock.

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H3-24

SHEEP KED ("TICK")

CAUSES UNTHRIFTINESS AND WOOL DAMAGE.

H. G. BELSCHNER, D.V.Sc., Deputy Chief, Division of Animal Industry.

THE sheep "tick" (*Melophagus ovinus*), **properly called ked, is not a true tick in the zoological sense. It is a wingless fly belonging to the order** *Diptera* **and family** *Hippoboscidae*.

Sheep are not greatly affected by a few of the parasites, but if in larger numbers their presence will be indicated by scratching, rubbing, and biting at the fleece. Loss of flesh and general unthriftiness will occur through the intense irritation set up. This is particularly noticeable in lambs, as the skin is tender and the number of parasites attacking them after shearing is usually large. The damage done to the wool is also considerable, and the growth and character of the wool is affected if the sheep is unthrifty.

It will be seen from their life history that, owing to the fact that the ticks are fully matured in five days after their emergence from the pupae, and that the female after copulation may deposit its first pupa in eight to ten days, a sheep lightly infested becomes in the course of a few months heavily infested.

Keds may be found on sheep at all times of the year. They are well distributed over the State, but are not found to any great extent in the far west of the State. It would appear that the extreme heat and dryness of the west are unfavourable to the parasites.

They are particularly noticeable at shearing time, when many are destroyed during shearing and others are carried away in the wool and perish. Their food consists wholly of the blood which they suck from the sheep. All breeds of sheep are subject to attack.

Description and Life History.

The sheep ked is a reddish or greyish-brown insect about ¼ inch long, covered with short spines, with a small head sunken into the thorax, and a large sac-like abdomen. It has six stout legs terminated by strong claws. The antennae are inserted into pits near the mouth, and the mouth parts are adapted for piercing and sucking blood. The parasite almost buries its head and proboscis in the skin, and once fixed hangs on for weeks. It is nimble and active, and migrates readily to another animal of the same species when disturbed.

The sheep "tick," unlike the true tick, spends the whole of its life upon the one host, which it never leaves unless to attach itself to another sheep. This migration occurs principally at shearing time, when the ticks leave the shorn sheep and crawl upon the lambs.

The female brings forth its young as nearly fully-developed larvae, which, when deposited into the wool of the host, are covered with a soft, white membrane. In about 12 hours this membrane becomes brown and hard, and the pupal stage is reached. These reddish-brown pupae, which are really cases containing embryo keds, are attached to the wool fibres by a sticky substance extruded by the female. It is these

Engorged Female Sheep Ked.

[After Marion Imes.

hard pupae that escape the destructive action of dipping fluids.

The young keds emerge from the pupal stage in from nineteen to twenty-four days, according to season and temperature, and immediately commence to work their way through the wool and attach themselves to the skin of the sheep.

Young female keds are capable of copulating five days after their emergence from the pupae and the males in about ten days. The female may extrude the first larva in a minimum period of thirteen days after her emergence from the pupa. The usual period is, however, longer—up to twenty-three days.

Each female deposits from eight to ten larvae, and the rate of extrusion is about one every six to eight days. The life of the ked probably does not exceed four or five months, and is commonly only three months.

The length of time the keds remain alive off their host is an important question and one frequently discussed among sheep men. Keds have been kept alive for eleven days and the pupae found to be viable up to forty-two days. However, even under favourable conditions the number of keds which survive for more than four or five days off the host and subsequently re-infest clean sheep can be regarded as very small. These would certainly not be sufficient to cause a general reinfestation of a clean flock or even of a fair number of the sheep. Most of the parasites found on previously dipped sheep are the progeny of pupae which have escaped the action of the dip.

There is no evidence whatever in support of the statement sometimes made that the ked breeds in scrub and timber which, moreover, would be contrary to everything known of its life history and that of similar parasites on other animals.

Treatment.

Various proprietary dips are employed to rid the sheep of external parasites. These may be divided into two main classes—those which destroy parasites in the process of feeding (known as stomach poisons) and those which destroy the parasites by coming in contact with them—known as contact dips.

The most widely used dips contain various mixtures and combinations of the following ingredients: arsenic, sulphur, various coal tar by-products (phenolic dips) and rotenone (derris root extract). In addition there are various new insecticides such as DDT (dichlor-diphenyl-trichlorethane), B.H.C. (benzene hexachoride) and others which open up distinct possibilities for the more efficient control of external parasites by virtue of their persistent contact action.

The main difficulty with all available dips has been the destruction of the ked pupae or the lice eggs, rendering it extremely difficult to obtain complete eradication with a single dipping, as undestroyed pupae and eggs subsequently hatch out. Many dip manufacturers have provided against this contingency by evolving dips which are reputed to protect the sheep against reinfestation up to a month after dipping.

Recent experiment work carried out by officers of the Council for Scientific and Industrial Research appears to indicate that the efficiency of a single dipping in the older type dips, although it cannot be expected to give complete eradication, is enhanced greatly if the dipping is carried out soon after shearing, when many ked pupae and a number of lice eggs have been removed, and there is no doubt about the destruction of all adults.

In the case of keds, those that do hatch out are in positions in the short wool which are unfavourable to their development, and with lice which are surface feeders, there will probably be sufficient poison left on the skin and in the short wool to destroy them.

With the ked, which is a blood-sucking parasite, the active principle of the dip must be a contact insecticide. Although arsenic can act both as a contact and stomach poison, its residual effect as a contact poison against the ked is not as great as it is as a stomach poison against the louse.

The older contact insecticides such as phenol, nicotine and derris root are not persistent. DDT and B.H.C. are new synthetic insecticides which are very persistent, and the manner in which these insecticides is incorporated into a dip will no doubt be considerably improved. By virtue of their persistent toxicity it would appear

that it may be possible to eradicate keds and lice in a single dipping with these new insecticides.

Time of Treatment for Sheep Ked.

Bearing the foregoing factors in mind, the best treatment for sheep ked is to dip *all* sheep on the property about a week after shearing. Another reason for recommending an early dipping is that, if the sheep are left for a month or six weeks before dipping, those pupae which have not been removed at shearing will have had time to develop and produce further eggs, which are difficult to destroy.

A second dipping twenty-two to twenty-six days after the first dipping is recommended if the older dips are used, as it is not safe to rely on the residual effect of these dips to kill the young keds when they hatch out. It is for this reason that the second dipping after the undestroyed pupae have hatched out is of value. If the period between dippings is too long, then a new batch of pupae may be produced which might escape the effect of the dip.

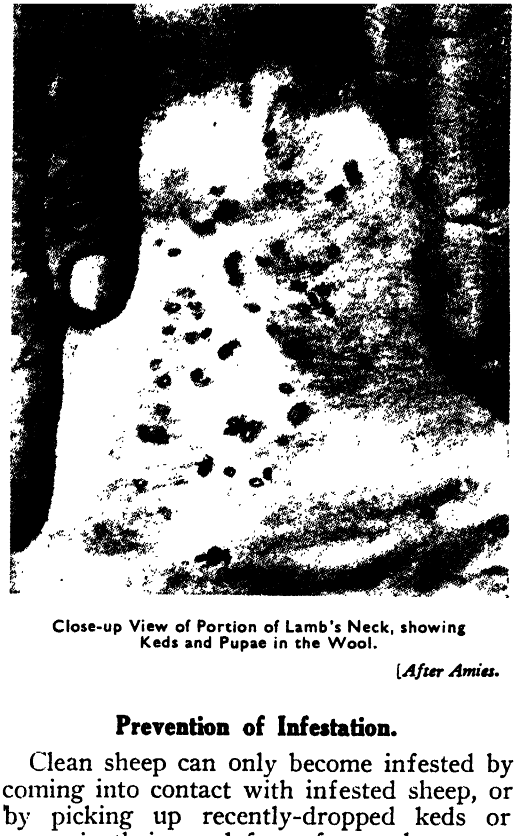
A single dipping is more likely to be effective in the complete eradication of ked if the newer, more persistent insecticides are used.

Precautions to be Taken.

There are several factors which must be kept in mind when dipping sheep soon after shearing. These are—risk of bacterial infection of the shear cuts, the possibility of arsenical poisoning if arsenical dips are used, and the danger of chill and possible mortality from pneumonia if the weather is cold. It is desirable to wait a week until the skin cuts have scabbed over before dipping sheep in any dip, and to avoid dipping in severe weather.

Of recent years lameness and loss of condition have occurred in sheep following dipping in non-bactericidal dips, even after the shear cuts have healed. This trouble has been found to be due to infection with a specific organism which is commonly present in arthritis in lambs. It has been noticed that the sheep most prone to be affected are those which have been put through late in the dipping, and often after the fluid in the bath has been allowed to stand 12 to 24 hours between usage. This short time apparently allows the causal organism, if present, to build up sufficient numbers to cause the trouble.

Investigational work has shown that the addition of a small amount of bluestone (copper sulphate) to the dipping fluid is effective in preventing the trouble. The organism appears to be particularly susceptible to the action of bluestone. The recommendation is that 3 lb. bluestone should be dissolved in 2½ gallons water and this solution should be added to the bath at the rate of 2 pints to every 100 gallons of dipping fluid, after which the bath should be thoroughly stirred.



Close-up View of Portion of Lamb's Neck, showing Keds and Pupae in the Wool.

[*After Amies.*

Prevention of Infestation.

Clean sheep can only become infested by coming into contact with infested sheep, or by picking up recently-dropped keds or pupae in their wool from fences, logs, etc., or the shearing-board and yards.

All enclosures such as shearing sheds and yards that have been occupied by ked-infested sheep should be regarded as dangerous for a period of at least six weeks, as the pupae may retain their vitality under certain conditions for this length of time. Most of the pupae remain in the wool, but

a certain percentage may be rubbed off in the yards and sheds, and young keds hatching from such pupae may afterwards get on sheep.

Clean sheep must be kept away from contact with "ticky" sheep, and the possibility of goats conveying keds to sheep must not be overlooked. Shearers and shed hands sometimes carry keds for a short time in their clothing and this should be kept in mind at shearing time.

If clean sheep are to be brought into enclosures recently occupied by "ticky" sheep, a strong solution of coal-tar dip should be freely used around the sides of the pens and yards, and on the shearing-board. This cannot be relied upon to kill the pupae, but it is useful in killing recently-hatched keds. In addition, all enclosures should be cleaned up and litter and manure disposed of.

Shearing removes a great number of keds, and care should be taken that lambs are kept well away from the shearing-board.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Rd., Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

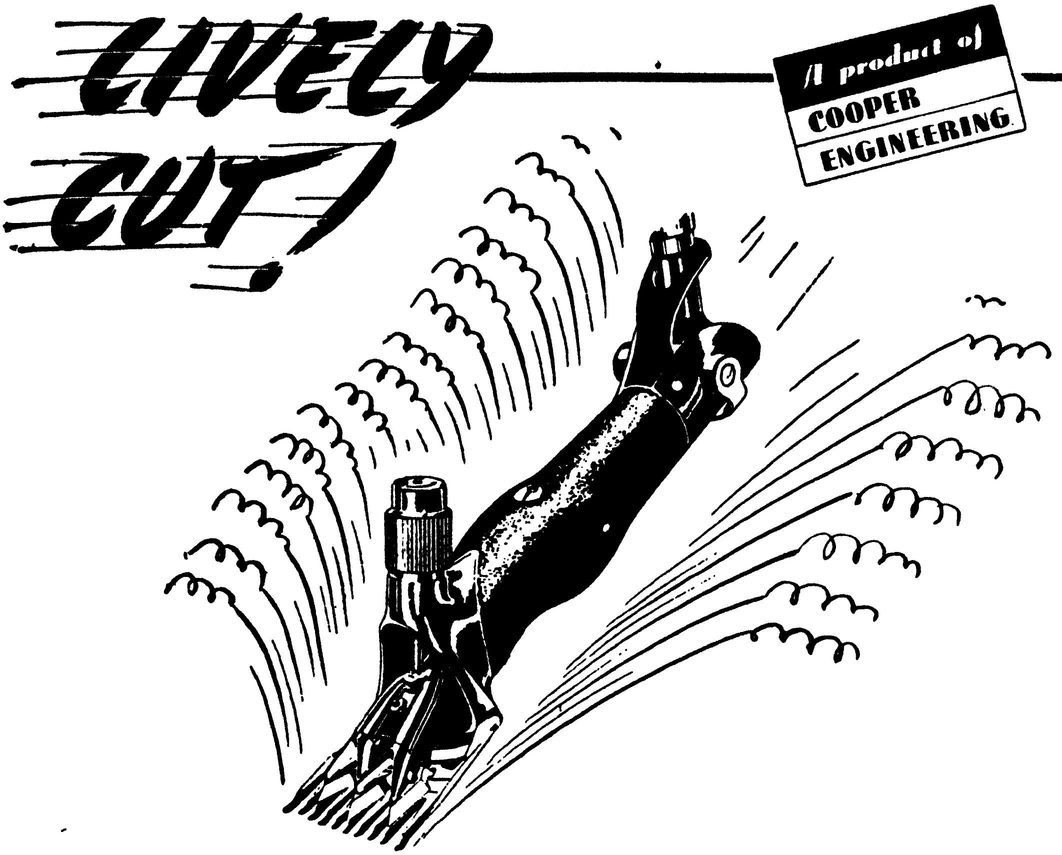
Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Wheat F.A.Q. Standard 1948-49.

THE Grain Section of the Sydney Chamber of Commerce has declared the F.A.Q. for the 1948-49 crop at 63½ lb. per bushel for both bulk and bagged wheat as compared with 60½ lb. for the 1947-48 crop. Samples totalling 285 were drawn from country receiving centres, of which 170 represented bulk wheat and 115 bagged wheat.

The composite samples submitted for weighing were made up of two parts from northern districts, three parts from western districts and five parts from southern districts. The samples were uniformly good from all parts of the State, medium strong to hard wheats predominating from northern areas. Millers expressed the view that, from the quality standpoint, the wheat this year was outstanding, and possibly creates a record.



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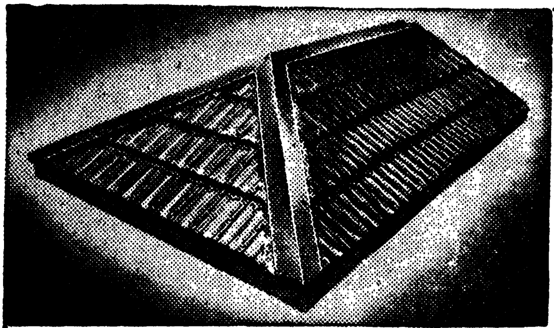

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POULTRY NOTES

CHECK OVER THE PULLETS.

E. HADLINGTON, Principal Livestock Officer (Poultry).

AT this time of the year the pullets should be checked over to cull out the "weedy" birds which are not likely to come on to lay for several months. Pullets which were hatched by the end of September will now be over five months old and should, if well reared, be showing some comb development which would indicate that they are not far off laying, but birds which have had any serious setback in rearing are usually very backward and unthrifty. These should be culled heavily as they are never likely to develop into profitable layers.

Unfortunately, there are many farms where there is a large proportion of these stunted pullets, and in some instances they are regarded as being unavoidable in the rearing of chickens. Such an outlook should not be entertained and every effort should be made to find the cause of the trouble.

In some cases the condition may be due to worm infestation, but even so this should not be accepted as inevitable in the rearing of chickens. It must be realised that worm infestation is largely due to running chickens on stale ground or land which has recently been occupied by adult birds; every effort should be made to raise the chickens on ground entirely separate from adult stock.

Where it is unknown whether or not the condition of the birds is due to worm infestation, the matter may be simply determined by selecting about a dozen of the most unthrifty birds, placing them in a crate with a slatted or wire floor, treating them with worm capsules and watching the results. If it is found that large numbers of worms are expelled it can be assumed that many of the others are also affected. If they are not too backward to have a chance of recovery, the whole lot should be individually dosed with a suitable vermifuge. Methods of treatment for round worms are given in a leaflet obtainable from the Department.

If it is found that worms are not present, other causes for the lack of development

must be looked for. It is probable that some of the following practices or conditions may be responsible: Unsatisfactory brooding conditions; overcrowding; too close confinement; unsuitable accommodation for the chickens after leaving the brooders; no proper facilities for teaching the chickens to perch, thus causing them to pack together at night; running too many chickens together; and rearing them on stale ground.

The ideal conditions for rearing chickens without a setback are to keep them in a suitable brooder for six weeks, then transfer them to cosy sheds without artificial warmth for another four to six weeks or until they have learnt to roost. When they are all roosting they should be transferred to large runs and accommodated in small, open-fronted houses where they can be left until they are ready to transfer to the laying quarters.

Under such conditions young stock can be raised with a minimum of losses and unthriftiness—and the result is they develop into better paying hens.

Particulars of suitable houses for rearing young and adult stock are given in a leaflet, "Housing Poultry," available at the Department.

Effect of Rearing on Cost of Production.

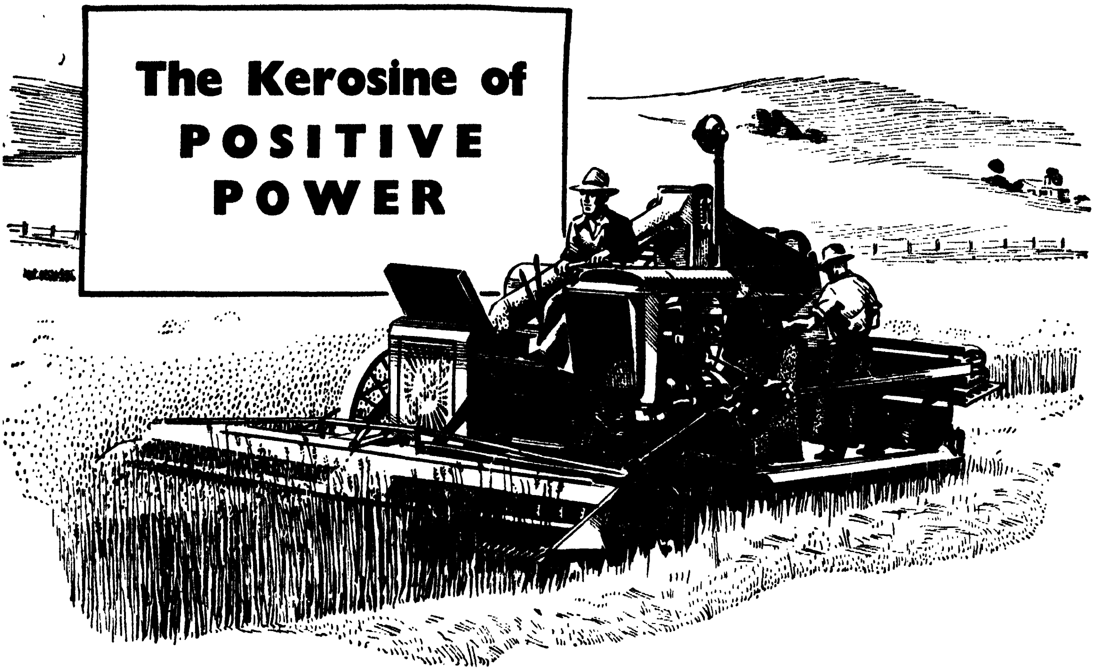
The present high cost of feeding poultry is an important factor in the cost of production, and renders essential the utmost efficiency in raising chickens.

In recent years there appears to have been an increase in the rate of mortality among young stock, and in some instances losses in excess of 25 per cent. from the day-old stage to productive age have come under notice. When such losses occur it is almost certain that many of the surviving birds have suffered some check in growth or general health, and consequently are not likely to be as profitable as those which are raised without any serious setback.

Pullets Raised under Good Conditions in Colony Houses.

Thus where there is high mortality among the young stock the effect on subsequent returns must be considerable, and in this direction there is scope for greater efficiency on many farms. It is true that diseases may, in some cases, be responsible for losses, but in many instances the conditions under which the chickens are raised accentuate the mortality.

It should be realised that with good rearing equipment and skilled management it is possible to raise chickens to productive age with no greater losses than 5 to 10 per cent.



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It must be apparent that when chickens are raised without undue setbacks they will develop into more profitable birds.

Management of Laying Stock.

ALTHOUGH production is expected to show a downward trend from now to about the end of May, the extent to which the fall occurs depends in a large measure upon management of the birds and housing conditions. These factors can often make all the difference between maintaining payable production and a heavy loss during the autumn.

Good management includes proper feeding, both as regards the composition of the ration and the method of feeding, as well as other details such as prevention of overcrowding, making sure that the perches are spaced sufficiently far apart to allow a free circulation of air between the rows of birds—not less than 20 inches apart—and keeping the houses free from parasites.

As far as feeding is concerned no drastic changes should be made at this period of the year, and it is essential that the birds receive as much food as they will eat. Thus in the case of dry-mash feeding care is necessary to see that the feed hoppers are functioning properly, as it frequently happens that the mash does not run freely and this results in the birds not receiving adequate supplies.

Where wet-mash feeding is practised the birds must be given just as much food as they will clean up in about an hour at each feed.

It will be found that the weather conditions influence the quantity of food required by the birds and the amount must be varied accordingly.

Again, as the season advances more birds will moult and this will reduce the amount of feed required, but this does not mean that moulting birds should not be given as much food as they will eat. The mistake should not be made of attempting to save feed costs by reducing, below requirements, the food of moulting birds because they are not producing; any attempt to effect a saving in this way will result in prolonging the unproductive period.

In cases where it becomes essential to effect a saving in the feed account the only course is to resort to culling-out some of the worst of the moulting birds.

Layers Kept Under Semi-intensive Conditions.
Good management at this time of the year helps to maintain production.

Housing Conditions.

Suitable housing also plays an important part in maintaining autumn production; some of the main housing considerations are: adequate ventilation to ensure fresh air circulation throughout the houses; ample roosting space, at least 7 inches of perch per bird; and in the case of intensive houses a floor space of not less than 4 square feet per bird. It is also advisable to maintain 4 to 6 inches of dry litter on the floors of both intensive and semi-intensive houses.

Use of Electric Light.

Where laying houses are fitted with electric lights production from hens can be increased during the autumn by their judicious use. For second-year hens the best course is to commence early in March to switch on the lights at 5 o'clock in the morning, then each month commence half-an-hour earlier up to 1st June, when the light would be switched on at 3.30 a.m. This practice should be continued through July. In August the lights should be switched on half-an-hour later (at 4 o'clock), and by a further alteration of half-an-hour (to 4.30 a.m.) on 1st September. At the end of September the lights should be discontinued.

For first-year hens the lights should first be used on 1st April at 5 a.m., changing on 1st May to 4.30 a.m., and on 1st June to 4 a.m. which is continued throughout July. The time is altered by half-an-hour to 4.30 a.m. on 1st August and again (to 5 a.m.) on 1st September. The use of lights should cease at the end of September.

The use of lights for pullets is not recommended except perhaps for backward birds which might be brought on to lay quicker by this means. Such pullets should be treated much the same as first-year hens, but the lights should be discontinued at the end of August.

The Halehaven Peach—A Variety of Promise.

Growers in the Hills District are impressed by the possibilities of the peach variety, Halehaven, and several orchardists intend to plant substantial areas to this variety.

This peach, it is stated, is a yellow-fleshed slipstone, maturing ten to fourteen days earlier than the Blackburn. It is round in shape, of firm texture and good colour—all features of advantage in packing and marketing. Tree growth of this variety has been vigorous, although during the first year of growth this characteristic was not manifest in all cases.

Halehaven was originally imported from the United States by the Department, and was thoroughly tested on departmental experiment farms before being released for trial by commercial growers. The variety showed early promise under Australian conditions, and in addition to the excellent qualities of the peach, its season of ripening indicated that it would be a valuable addition to the varieties here. It was first planted in the Hills District in 1944 and 1945. The trees were distributed to growers for testing at West Pennant Hills, North Ryde, Galston and Glenorie.

The variety has created a favourable impression wherever tested. It is felt that this attractive, firm-fleshed variety maturing about the Christmas period will be useful in enabling supply to distant markets, especially as Halehaven has a reasonably long market life after harvest.—DIVISION OF HORTICULTURE.

Rabbit Extermination—Dangers of Using Lump Sodium Cyanide.

TESTS carried out by the Department on the use of lump sodium cyanide for the extermination of rabbits have shown that, while material of this kind will kill rabbits, its efficiency is impaired by the slow liberation of hydrogen cyanide. Furthermore, any such material spilled or left lying around burrows constitutes a source of danger for some considerable time.

As calcium cyanide has not been available to landholders for several years, the Department was requested to investigate the fumigation value of sodium cyanide. This poison is sold commercially in lump form, and it was shown in departmental tests that even after six days, 40 per cent. of the available hydrogen cyanide in the material examined had not been liberated.

Subsequently officers of the Department investigated the loss of nine sheep that had been killed by rabbit poison (sodium cyanide) spilled while being transferred to smaller containers and left in uncovered burrows within easy reach of sheep.

In addition, samples of fumigant material that had remained in rabbit burrows for various periods were submitted for testing recently. Analysis of a sample of material that had been in a burrow for 42 hours showed that 82 per cent. of the available hydrogen cyanide remained unliberated. Corresponding figures for samples that had remained in burrows for 72 and 92 hours were 70 per cent. and 69 per cent., respectively.

These figures are in reasonably close agreement with figures obtained under laboratory conditions. They confirm the opinion previously expressed that the material would be a source of potential danger to stock for some considerable time if any of the material is left lying around, or if it is not placed sufficiently far into the burrows to be inaccessible to stock.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australasian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Bathurst Rxperimantal Farm	46	29/6/49
Bradley, H. F., "Nardoo, Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys)	119	28/3/49
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park" Mumbil (Beef Shorthorns)	74	2/2/49
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/12/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Rav Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Riverina Welfare Farm, Yanco	55	6/12/49
Rowlands, F. C., "Werribee," Waugoola	35	23/8/49
Rowntree, E. S., "Mourable," Quirindi (Jerseys)	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161	16/2/49
Wagga Experiment Farm (Jerseys)	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake	14	20/9/49
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, E. A., Four Mile Creek, Eeat Maitland	43	12/11/49
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lea.ands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell	34	5/4/49
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/7/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H. Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	80	4/2/49
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	11	12/4/49
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B. "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	29	4/3/48
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	29	11/6/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*					
St. Patrick's Orphanage, Armidale	12	8/10/50	Waddell, W., "Afton," Oakwood Rd., Inverell	127	5 7/49
St. Vincent's Boys' Home, Westmead ...	30	9/7/49	Waters, A., Marsh Street, Armidale	2	8/10/49
State Penitentiary, Long Bay	14	27/11/49	Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Stephenson, W. J., "Hill View," Fig Tree ...	54	5/4/49	Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Tanner, F. S., Dural Rd., Armidale	42	8/10/49	Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49	William Thompson Masonic School, Baulkham Hills	55	27/4/49
Tombs, R., Harlwood, Armidale	37	8/10/49	Williams, L. B., "Birida," Armidale ...	39	12/4/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49	Youth Welfare Association of Australia ...	171	14/4/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	97	24/4/49			
Ursuline Convent, Armidale	5	7/10/48			
Von Frankenberg, F. E. "Spring Hills," Camden	61	7/12/49			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Insect Pests.

(*Continued from page* 151.)

wherever the slaters are congregating or causing damage, but care should be taken where it is placed as metaldehyde is poisonous.

Slugs.

Slugs usually feed at night, and they thrive best under moist conditions. They occasionally damage mushrooms by eating the caps and stems. Large irregular holes are left where they have been feeding.

Control.—Control may be obtained by using the metaldehyde-bran bait as recommended above for slaters. Unless they are numerous, however, the simplest method of control is hand collecting at night.

Rats and Mice.

Rats and mice occasionally eat mushrooms and also may dig into the beds and disturb the mycelium. The methods recommended for the eradication of mice and rats are given in a leaflet, "Control of Mice and Rats," which may be obtained free on application to the Department.

UNDER the five-year plan to improve the efficiency of the dairying industry, demonstration farms are to be established throughout New South Wales by means of co-operation between individual dairy farmers, farmers' organisations and the Department of Agriculture. The object of these farms generally will be to demonstrate what can be done towards increased dairy production by such measures as pasture improvement, fodder conservation, supplementary feeding, herd recording, etc.

AN official forecast for this season's oat yield, made by the Division of Marketing and Agricultural Economics, has been set at 10,000,000 bushels of grain and 163,000 tons of hay for this crop.

THE AGRICULTURAL GAZETTE FOR APRIL, 1949

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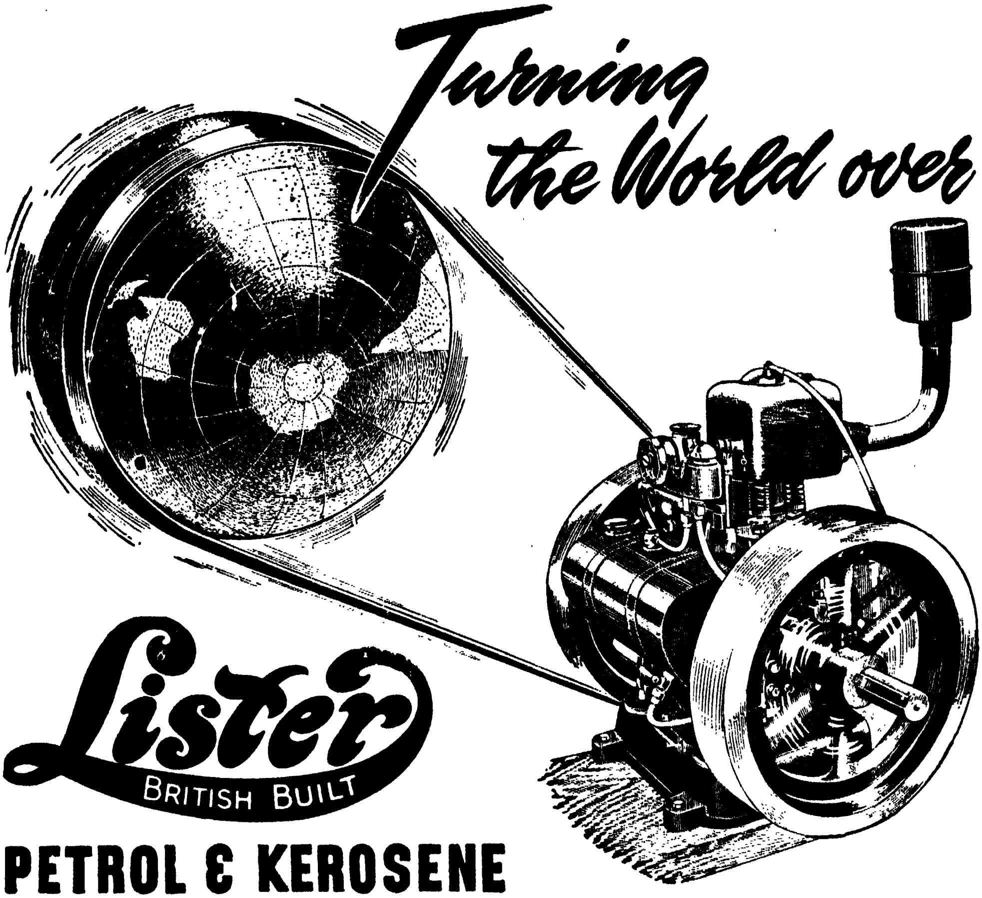

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Editorial—

FREE SERVICES.

VISITORS to the Department's Court in the Agricultural Hall at this year's Royal Show will be struck by the emphasis laid on the fact that the multitudinous services rendered primary producers by the Department are free.

No other industry is catered for as fully or as helpfully as the primary industries. So extensive are these services that it is conceivable that producers are hesitant about calling in or consulting local field specialists, believing that necessarily there must be a charge for services rendered. There is not, and it is felt that the point needs stressing.

Expert officers—specialists in crop farming, fruitgrowing, sheep and wool, dairying, vegetable growing, pigs, poultry, bee-keeping, disease and pest control, marketing, pastures; in fact, every side of farming—are located either in district centres or at head office.

Whether you are long-established or just launching out in a farming venture these men are at your service.

You may seek their advice on the choice of land for the use you have in mind. They will guide you through the initial years of establishment—how you should subdivide your land; what crops to grow; how to grow, harvest and market them; what machinery you require; what stock you should run and how to manage them.

You may, and should, consult them on farm costs, marketing, how to protect your crops and stock from diseases and pests. All very valuable assistance to the new-comer to farming. And all free.

No matter how long you have been farming, each year brings new ideas, new problems. Adoption of those ideas, finding the solutions to those new problems, mean easier going for the man on the land and a greater return for his labour. The services which will keep you abreast of the times are available from the Department of Agriculture for the asking. There is no charge.

Payment for exported primary products is the main source of this country's wealth. Thus it pays the State handsomely to invest in these free services, designed to improve both the quantitative and qualitative output of primary industries.

The extent of the dividend which such a State investment pays is dependent on the extent to which primary producers make use of these *free* services. Are you making use of them?

State's Five-year Dairy Plan in Full Swing.

"As part of the State's Five-year Plan for the promotion of improved practices in the dairying industry throughout New South Wales, the Department of Agriculture has selected thirty-three dairy farms, including properties in inland areas, for the purpose of showing dairy farmers how to obtain increased yields from their herds by applying the latest proven scientific methods to their industry," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.).

"This plan is very wide in scope and includes sire surveys, herd wastage surveys, pasture improvement and management, feeding demonstrations on dairy farms, general publicity, grade herd recordings and dairy farm competitions," added the Minister.

"In each of the coastal dairying districts at least half a dozen farms have been selected for practical demonstration purposes," continued Mr. Graham.

"These demonstrations cover general management of dairy farms, pasture improvement, irrigation, braken fern control, reclaiming worn-out pastures, treatment of sod-bound paspalum areas, carpet grass, concentrated feeding and establishment of lucerne and rotational grazing.

"The selection of these farms has in itself been a lengthy process," said Mr. Graham. "It has been essential to choose properties which are typical of those in each district and carry average herds. Our objective is to show farmers in those particular areas that improvements such as we have brought about can be readily adopted by them on their own properties."

Condobolin Pastures Protection Board is Tackling the Rabbit Problem.

"An exceptionally efficient job is being done by the Condobolin Pastures Protection Board with tractor and ripper attachments in destroying rabbit warrens and burrows on Travelling Stock Reserves under its control." Making this statement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said:—

"After an intensive and careful test, the Condobolin Pastures Protection Board has found that an average of sixty warrens can be ploughed out in an eight-hour working day at a cost of 2s. per warren. Under these conditions the use of a tractor and ripper is undoubtedly one of the most efficient and cheapest methods of destroying rabbit warrens and burrows.

"The ripper attachment is specially made for the purpose of destroying warrens and is so constructed that it can be pulled by an ordinary powered tractor.

"Any landholder who owns a tractor can exterminate rabbits on his property if the land is such that a tractor can be worked on it," said Mr. Graham. "Naturally, steep rocky country would not be suitable."

Conserved Fodder Helped a Narromine Grazier.

Telling of his experience of fodder conservation, a grazier from Narromine writes:—

"Apart from the financial aspect, the man who has adequate fodder reserves has no worries about dry times, and has the satisfaction of knowing that he can treat his stock humanely in a drought. Moreover, with fodder conserved on the farm, a dry year can be turned into a profitable one.

"The man who conserves fodder can show a profit every year—whether in a good or a bad season. He does this by keeping his stock in good condition during a dry time. If he is wise he sells his fodder only when he knows that his growing crop will replenish his reserves.

"I grow oats for hay on fire breaks around my wheat crops. Last year the oats usually kept for conserved grain had already supplied winter grazing for stock before being harvested. It will often supply another crop the following year as a self-sown crop.

"I would say that fodder can be produced and stored in the Narromine district for a quarter the cost at which it can be sold in a drought. If a farmer has feed on hand he will feed it to his stock when they need it, but if he has to buy it he will often sell his stock at low prices, or commence feeding later than he should have. The stock are then poor, liable to worm infestation and lambing troubles.

"During years past, grasshoppers on three or four occasions have denuded my land of grass when rainfall was good—and conserved fodder has helped me through these times."

CAULIFLOWER GROWING.

A Profitable Crop under a Wide Range of Conditions.

A. C. ORMAN, H.D.A., Special Agronomist.

ALTHOUGH cauliflowers are normally a cold climate crop, modern plant selection work and the adoption of suitable cultural techniques have enabled growers to produce crops almost to perfection in every district of the State. Small market gardeners produce high-quality cauliflowers in climates differing as widely as those of Menindee on the Darling River, Inverell in the north-west, locations in the Richmond River (North Coast) district, at Bathurst, Armidale and Cooma on the cold tablelands, and in almost every locality in the central and southern coastal areas; while this is so, the large commercial growers are situated in the Bathurst, Windsor-Richmond, Maitland-Singleton, Nowra, portions of the Northern Tablelands, and the Narrabri districts.

Climatic and Soil Requirements.

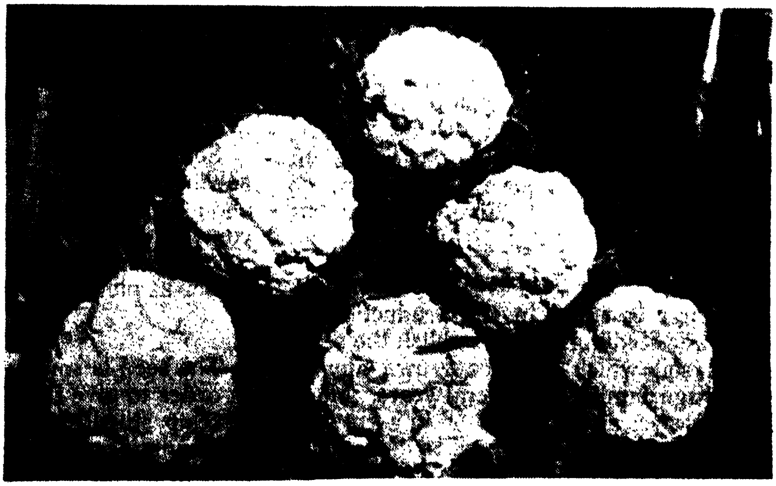
The cauliflower reaches its best development in districts where the climate is cool, with uniform temperatures, particularly during the latter half of the growing period of the crop. Being a leaf- and curd-producer, the cauliflower requires a very even supply of water during the growing period.

A fertile, well-drained soil abundantly supplied with organic matter, provided it is not too acid, is most suitable for cauliflowers; alluvial soils are ideal. On the other hand, provided heavy applications of organic manure and artificial fertilisers are used, cauliflowers can be grown on poorer soils. By the adoption of good methods the best growers around the Metropolitan Area can raise very profitable crops of cauliflowers on such poor soils as the Botany sands, and the medium-poor clay loams of the Hills district.

Naturally, hot weather during transplanting interferes with the establishment of the seedlings in the field, even when plenty of water is available, and in districts along the coast heavy loss is experienced each year with the early crop from this cause. Again, hot weather occurring during curd formation usually causes discolouration, "fuzziness" and "riciness," and hastens overmaturity. Some authorities contend that high temperatures also encourage the growth of the small heart leaves which sometimes protrude through the curd.

Seeding Dates.

There is a keen demand for early cauliflowers, with the result that practically every



Six Good Quality Cauliflowers.

grower in all districts endeavours to market cauliflowers by the end of March or April. The success of this crop is usually dependent on the variety grown and the weather at the time the curd is developing. If the autumn is late and hot weather is experienced around towards the maturing of the crop, then the curd may have all sorts of physiological defects and the crop be practically unmarketable.

In tableland districts, such as Bathurst, seeding is usually commenced in late October or early November, using early and mid-season varieties for marketing from March onwards. In coastal and western districts the seed is rarely sown before December. By using varieties of different maturity growers are able to market over an extended period.

Varieties Recommended.

The following varieties are recommended for the various districts. The average maturity periods given are from time of transplanting to time of harvest, assuming that transplanting is carried out six weeks after seeding.

(*a*) *Tableland Districts.*—Russian 2A (10 weeks), Phenomenal Twelve Weeks (3 months), Snowball (3 months), Nugget (4 months), Hawkesbury Solid White (4 months), Shorts (4½ months), Five Months Special Giant (5 months), Phenomenal Five Months (5 months).

(*b*) *Western Districts.*—Russian 2A (10 weeks), Nugget (4 months), Hawkesbury Solid White (4 months), White Queen (11 weeks), Snowball (3 months), Phenomenal Five Months (5 months), Phenomenal Maincrop (6 months).

(*c*) *Coastal Districts.*— Nugget (4 months), Hawkesbury Solid White (4 months), Russian 2A (9 weeks), Shorts (4½ months), Five Months Special Giant (5 months), Phenomenal Maincrop (6 months), Phenomenal Five Months (5 months).

The Seed-beds.

The first essential in the production of cauliflower seedlings is to establish the seed-beds in soil which has not grown any of the cabbage family for several years. Many of the diseases and pests found in a growing cauliflower crop can be traced to contamination in the seed-bed.

The richest and best-drained portion of the farm should be selected for the seed-bed site. Two months prior to seeding, the beds should be given a heavy dressing of lime or dolomite (at the rate of from 1½ to 2 tons per acre or ¾ to 1 lb. per square yard) which should be worked into the soil. Cauliflowers are heavy users of lime. Heavy dressings of organic manure will assist the plants, while a light dusting of superphosphate encourages root development.

Flat beds are the most suitable type for cauliflowers; raised beds dry out too rapidly during the hot weather, and are liable to causes stunting of the seedlings.

Size of the Seed-beds.

The best type of seed-bed is one no wider than 6 feet and as long as convenient. If the seed is sown in rows 6 inches apart, a bed 6 feet wide by 85 feet long will require 4 oz. of seed and will provide sufficient plants for an acre. There are so many advantages attached to sowing seed in rows that few growers practise broadcasting these days. The rows are made across the bed. as this enables the grower to weed and lightly cultivate with the hoe without walking on the bed.

A very practical method of marking the seed rows is to obtain a 6-inch wide paling and force one edge into the soil. The paling is then flopped over and the outside edge forced into the soil. This operation is repeated until the whole of the bed is marked out into even drills 6 inches apart. The drills should be deep enough to enable the seed to be planted in the cool, moist soil; at the same time, if the furrows are too deep the plants will not be able to force their way to the surface. Experience has shown that ¼-inch to ¾-inch is the right depth of sowing.

Some growers now adopt the practice of sowing the seed by machine in drills spaced about 18 inches apart to facilitate weed control.

Approximately 4 oz. of seed will provide sufficient plants for an acre.

Sowing the Seed.

The seed is sown very thinly in the drills in order to give the plants sufficient room to develop sturdily. A good practical method of sowing cauliflower seed is to place the seed in a bottle fitted with a cork cut with

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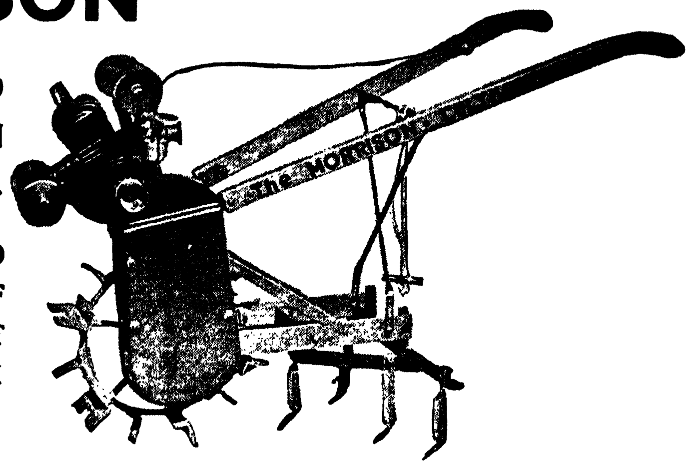

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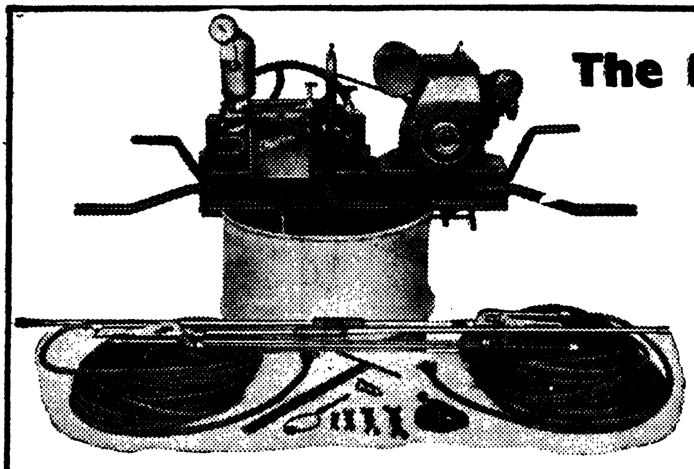

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a V-shaped furrow down the side. When the bottle is inverted the seeds runs down the cork in a steady stream. The rate of seeding can be regulated by the speed with which the bottle is brought along the seed drills.

Cauliflower Seedlings Propagated in 3 feet Beds.

After sowing, the seed is covered by raking the surface and the bed compacted with a light board and saturated with water through a fine rose. After the surface of the soil dries a little the bed can be mulched with rotted manure.

The care of the seedlings in the seed-bed is most important, as experience has shown that if clean, healthy plants are produced the crop gets a good start, whereas if the plants are diseased or infested with insect pests in the seed-bed the grower will be put to great trouble to ensure a clean crop. When the seedlings are confined to a small seed-bed not much time is required for treatment, but once they are set out in the field the operator must cover a wide area to treat the plants. There is no excuse for growers not having clean plants at all stages of growth in the seed-bed.

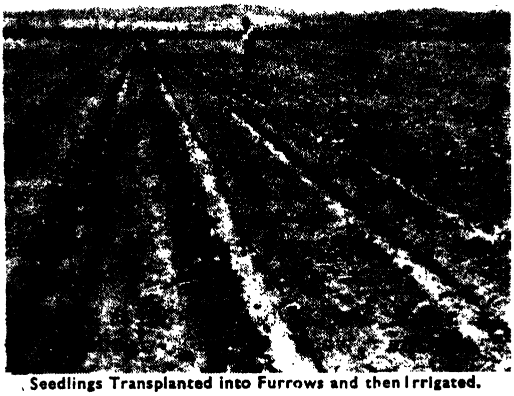
Watering of the bed depends entirely upon the condition of the soil and the seedlings. When watering is necessary, a heavy soaking should be given rather than several light waterings.

Preparations for Transplanting.

The seedlings occupy the beds for a period of from six to ten weeks, the rate of growth depending on the variety and the attention given. When the plants are about 4 to 6 inches high they are ready to be transplanted. The usual procedure is to water the seed-beds thoroughly before removing the plants and to pull the biggest seedlings from the rows, allowing the smaller ones to remain until they reach a suitable size.

The roots should be disturbed as little as possible and the plants set out in the field with the minimum of delay. Transplanting should take place in the afternoon or during cloudy weather so as to enable the plants to become established without a check. After rain is a good time to set out the seedlings. If the soil is dry it should be irrigated and transplanting carried out in the moist soil. It is important that the holes be deep enough to accommodate the plants without twisting or compacting the roots.

Many growers make it a practice to grasp small bundles of seedlings by the roots and vigorously wash the tops in a solution of nicotine sulphate before taking to the field. The object of this treatment is to ensure that the plants are absolutely free of all insect pests.



Seedlings Transplanted into Furrows and then Irrigated.

Crop Rotation and Land Preparation.

In the chief growing centres along the coast of New South Wales, cauliflowers invariably follow early potatoes as a rotation crop. This is practically an ideal rotation, provided that it is not repeated under two-year intervals. Field results have shown that liming of the soil encourages scab formation in potatoes. On the other hand, it

has been proved that the application of 30 cwt. of lime (preferably magnesium limestone) per acre is of outstanding value to the cauliflower crop. Growers will be wise to take advantage of this liming by using the land to grow spring or summer beans after the cauliflowers.

In the soil preparation for cauliflowers it must be borne in mind that the crop is a heavy feeder and demands the best of soil conditions. Make the ploughing deep, turning in the residue of previous crops and any weed growth. Growers in tableland districts are specially recommended to grow a green manure crop prior to cauliflowers. Blue lupins, if grown the previous winter, are considered to be the best of all green manures. Black cowpeas, sown in spring, have proved to be the best summer green manure crop. A long bare fallow should precede cauliflowers in the drier districts dependent upon the natural rainfall.

Organic manure of any kind is a distinct advantage when growing cauliflowers. Twenty tons of farmyard manure is considered an average dressing, and in the Metropolitan Area, where poultry manure is available, dressings of 2 to 3 tons per acre are not considered excessive, provided that they are balanced up with applications of superphosphate.

Even on the richest alluvial flats, it has been found that the crop will respond to nitrogen. The best fertiliser mixture to use as a base dressing is three parts superphosphate to one part sulphate of ammonia at the rate of 8 to 10 cwt. per acre. This mixture can, with advantage, be used to supplement any organic matter worked into the soil.

Some of the best cauliflower growers prefer fertilisers such as blood and bone to superphosphate and sulphate of ammonia as they find "whiptail" disease is less likely to occur. Measures for "whiptail" control by the use of molybdenum have now been developed by the Department of Agriculture and are described in a leaflet obtainable from the Department.

Loading Cauliflowers for Market.

It is always an advantage to bare fallow the soil for not less than six weeks prior to transplanting, although in western districts, especially where irrigation is not practised the land should be fallowed for as long as possible. This fallow should be kept free of weeds and the land should be given a shallow ploughing or two when necessary. There is no advantage in having a superfine bed for cauliflowers if the soil is in good condition.

The Method of Transplanting.

In U.S.A. and Victoria the large cauliflower growers employ transplanting machines which not only open drills, fertilise and set the seedlings, but also give each plant a pint of water.

Many methods are employed in New South Wales; the most successful on flat country is to open up shallow drills with a single furrow plough, run irrigation water

down the furrows, and then set out the seedlings in the moist soil on the side of the furrows. The growers using this method can, with little trouble, give the seedlings two or three thorough soakings before it is necessary to cultivate the soil. Another advantage of this method is that the base fertiliser can be spread along the row directly under the plants with little difficulty.

The flat method of growing is not quite so satisfactory. Here, growers mark out drills and set out the seedlings by making dibble holes by hand, setting the plants and watering at the same time.

Spacing.

Cauliflowers require a good deal of room to develop. Although the fashion in this country is for very large cauliflowers, there is a general movement to change over to the smaller, higher-quality types. Large, late-maturing varieties, such as Phenomenal, should be spaced 30 inches apart in rows 36 inches apart. On the other hand, the small, early-maturing types can be planted out as close as 24 inches apart in rows spaced 30 inches apart. In the drier districts, in the absence of irrigation, plants may be spaced 5 feet apart in rows 6 feet apart. Generally speaking, it is better to have the rows too wide apart rather than too close; this is particularly the case when irrigation is difficult, or is not practised.

Inter-row Cultivation.

The cultivation of cauliflowers should be thorough at all stages, as the plants will not thrive if subject to competition from weeds. In the early stages of growth the seedlings are established on the side of an irrigation furrow. With the inter-row cultivation this furrow gradually fills up. Many growers take advantage of this operation by spreading a fertiliser mixture along the drill prior to the first cultivation, this fertiliser taking the place of the base manures.

When furrow irrigation is practised a duckfoot tine is fitted to the back of the one-horse cultivator so that the cultivation and opening of an irrigation furrow can be carried out at the one time.

To destroy weeds between the plants, hand hoeing must be resorted to, unless the seedlings are planted out on the square. Some growers smother the young weeds by hilling the plants when still young. While the plants are small, cultivate deeply. As the plants develop, cultivation should be shallow so as not to destroy many of the surface roots. As the crop approaches the cutting time it is necessary to irrigate and fertilise, although many growers totally neglect inter-row cultivation.

Cauliflower Plants in the Seeding Stage.
Three rows of plants have been left at the side of the bed.

Irrigation.

Water regularly to ensure uninterrupted development. In heavy soils under sprinkler

irrigation it may be an advantage to cultivate before watering.

Forcing and Blanching.

As the crop advances in growth it reaches the "button" stage, the "button" being the miniature curd. It is from this stage onward that the quality of the heart may be controlled.

In districts where whiptail is not a problem it is recommended that the crops be side-dressed with a nitrogenous fertiliser at the "button" stage. When poultry manure is available, a dressing of a ton per acre may be given. In the largest cauliflower growing districts, at least one side-dressing of 1½ cwt. per acre of sulphate of ammonia or preferably nitrate of soda is recommended. The readily available nitrogen forces the curd development, increasing size and quality.

After side-dressing, the plants should be examined every few days in order to note when the crop will be ready for cutting. It is during these inspections that plants are often noticed with portions of the curd exposed to the light. Sunlight has a very detrimental effect on the colour of the curd, which the grower should make an effort to protect. Many growers go to the trouble of tying the leaves, which is a rather laborious, although very effective, means of blanching the curd. It does not in any way influence the development or size. A good method is to break the main leaf rib of a large leaf (or two) and bend it over the developing curd.

The Italian type of cauliflower has very straight, erect green leaves, which give little protection to the curd. It is essential to blanch these varieties.

Harvesting.

In recent years, when the best varieties of cauliflowers have been rigidly selected for uniformity of quality and maturity, many beds of cauliflowers of the one variety are harvested over a period as short as about one week. In badly selected seed the cauliflowers are liable to reach the cutting stage over periods varying up to six or eight weeks. While varying maturity may be useful to the home grower, uniform maturity in a variety is of great assistance to the commercial grower.

The crop must be examined daily during the cutting period, as the curds remain at their highest quality for a period of a day or two only, then becoming over-mature and losing commercial quality and value.

In New South Wales it is the custom to harvest practically the whole of the cauliflower plant, as the outer leaves give some protection to the curd during transportation. The plant is cut off with a small, axe-like cutter, or knife.

Some growers make provision for a roadway through their crops to enable the use of high-wheeled carts, into which the harvested cauliflowers are loaded. Other growers plant out their field so that four to six rows of early-maturing cabbages are spaced throughout the cauliflower crop at regular intervals. When the cabbages are cut several weeks prior to the harvesting of the cauliflowers, roadways are left for the cauliflower vehicles. The cauliflowers are later transhipped to motor lorries for market.

Grading.

In Australia the grading of cauliflowers is done by the grower or by the agent. Many growers who market their own cauliflowers have their cutters trained to grade in the field. The men make a mark on the base of the stalk to indicate lower grades, the top grade being left unmarked. The second-best grade will have one knife slash across the stem base, the following grade, two slashes, either parallel or crossed, and the lower grades are marked accordingly. This practice facilitates grading by the agents in the markets.

Marketing.

Cauliflowers are sold through the vegetable market in Sydney or country centres, being sold loose at so much per dozen, by auction or private sale.

At Long Island, New York, cauliflowers are all trimmed ready for sale on the farm. They are then graded for size and quality and packed in crates with the curd facing the outside. A crate holds twelve to eighteen heads, according to the size. This enables the buyers to examine the quality of the flowers through the slats.

Although the crates would be somewhat expensive in this country, they could be

(*Continued on page 212.*)

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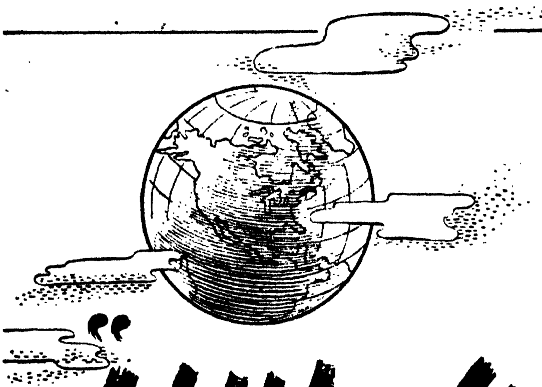

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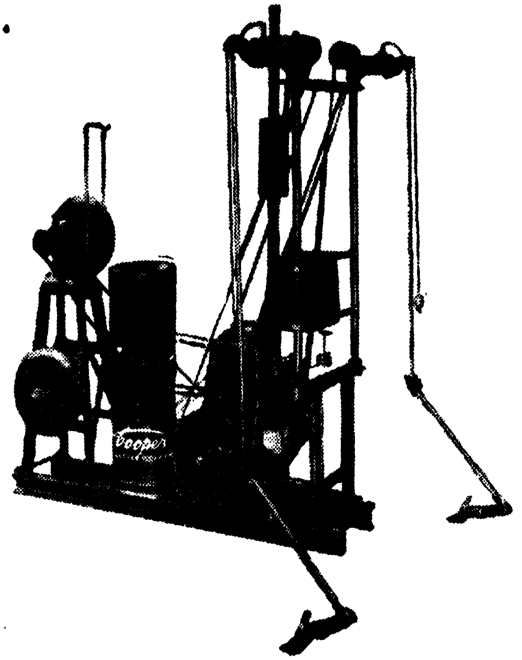

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

Market Your Produce with Care

It Pays Good Dividends.

CAREFUL handling of produce from the farm to the consumer is all-important in achieving maximum farm income. Time, effort and money having been used by the farmer to produce a high quality product, it is essential that no part of this expenditure is wasted through deterioration of the product before it reaches the consumer. This applies both to the home and overseas markets—particularly to the latter, where condition and quality of goods go far in establishing a reputation and consequently a ready and permanent market.

Care in handling is an important consideration for all primary products, but the care needed varies with the nature of the product, its perishability, the ease with which it can be handled, the number of hands through which it passes between producer and consumer and the degree to which the product can be separated into various grades or brands.

A High Quality Product.
Time, money and labour used to produce this fruit could be wasted as a result of faulty handling during harvesting and marketing.

Less Perishable Products.

Careful handling is of less importance with products such as wheat and wool—which can be handled easily and stored without undue deterioration in transit to the consumer—than it is in the case of, for instance, fruit and vegetables. But even the less perishable commodities require a certain amount of care and skill in handling. For example, wool must be expertly graded and wheat must be properly stored to prevent deterioration caused by weather and pest attacks. The condition in which meat reaches the consumer is to some extent

dependent on efficient handling after leaving the farm, although the quality of meat as purchased by the consumer is largely determined by production methods. Most damage to carcases occurs on the farm as the result of bruising by kicking, prodding and often unnecessary ill-treatment of the animals. However, method and distance of transport to the market may greatly affect the final quality of meat.

The fact remains that, due to the nature of each of these products—wool, wheat and meat—once the farmer has done all in his power to produce the high quality product demanded by the consumer, he can do comparatively little more to influence the condition in which his product reaches the consumer.

Easily Damaged Products.

This is not so in the case of the more perishable and more easily damaged products—particularly fresh fruit and vegetables, milk and milk products—where maintenance of quality between the stages of production and consumption is much more dependent on the farmer. Despite the excellence of the fruit on the trees, or the high quality of the milk from the cow, the product can, and often does, reach the market completely useless, thus causing disastrous financial losses to the producer.

Care in Choice of Variety.

The producer can do much to maintain the standard of his product on its way to the consumer by careful supervision of the harvesting and handling of the fruit or vegetables before they pass out of his control. The variety of fruit or vegetable often has considerable influence in determining both the ability of the product to stand up to the handling involved, and its keeping quality. For instance, Valencia oranges keep better and are less liable to wastage than are Navels. Different varieties of potatoes, too, show wide variations in keeping quality. It is desirable, therefore, that distance from the market, and the requirements of the market, be taken into consideration by the farmer in determining the variety he will grow.

In this Shed Citrus Fruits are washed Before being Packed.

The growers realise that attention to the appearance of their product is important.

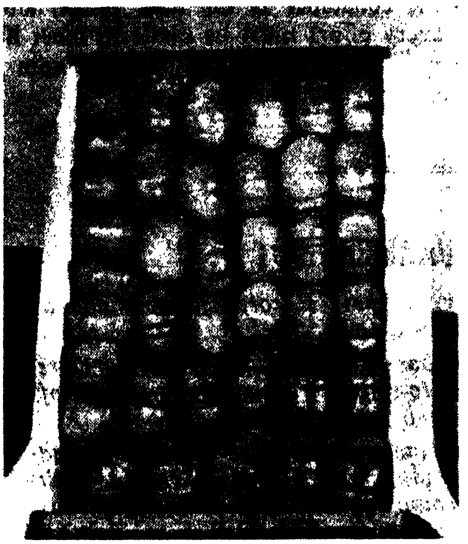
Care in Harvesting.

The stage of development at harvesting is an important determinant of the final condition of the produce. Immature or over-mature fruit and vegetables are not readily saleable. Not only do they represent a loss to the grower, but during glut periods they also help to accentuate low prices. Avoidance of the marketing of such produce would often go far towards preventing the glut and maintaining the general level of prices above the depressed level of oversupply.

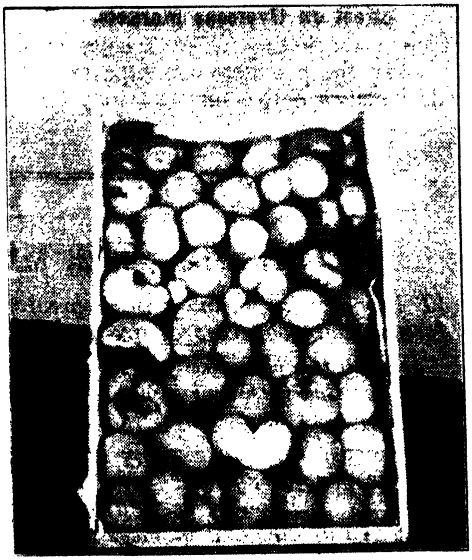
Care in harvesting is essential; careless pickers may cause considerable damage to fruit and vegetables. At this stage the produce is easily bruised or punctured. Often such damage escapes detection in sorting, but becomes only too apparent when the goods are opened for final sale.

Care in Grading.

The ill effect of badly graded and sorted produce on the price received by the farmer is more than a reflection of the actual amount of poor quality goods present in the pack, and the presence of a few rotted fruits will reduce the market value of a case to a greater extent than the value of the actual proportion of fruit lost. Growers should continually bear these facts in mind. The Queensland *Fruitgrowers' Gazette* recently emphasised this fact: It stated that "Each summer growers suffer serious and unnecessary financial losses resulting from bananas arriving on the market in a mixed ripe condition, which is one of the main causes of poor clearances and low prices." In the article the need was stressed for careful selection of fruit at the correct stage at harvesting, for fruit to be cut in the cool of the morning and transferred as rapidly as possible to the packing shed, for open-stacking in a cool place and for quick despatch by rail after leaving the stacks, in order that fruit should reach the market in a uniform condition.



A Good Line of Tomatoes Well Graded and Presented.
Received top prices.



An Ungraded Bad Line of Tomatoes.
These were unsaleable and a total loss to the grower.

Care in Packing.

Efficient and attractive packing goes far toward bringing the maximum price for the product, assuming it is of desirable quality in the first place.

Branding of the goods may also result in increased sales as the consumer learns to differentiate between the various brands. Establishment of a reputation for consistent quality helps to stabilise demand for the goods and to encourage increased consumption. At all times the requirements and reactions of the consumer must be kept in mind.

Special Attention During Periods of Oversupply.

Attention to the preparation of products for market is of special importance under conditions when production exceeds consumer demand—either as a result of over expansion of the industry or of a reduction in consumer purchasing power. The former condition is being approached with several fruits at the present time and occurs at times with most types of perishable products. Production of bananas has increased so substantially in recent years in New South Wales that already disposal of the crop and avoidance of gluts are becoming

problems in the industry. Citrus production, too, has expanded recently and with the withdrawal of service requirements growers are finding it necessary to make every effort to market their product efficiently, to reduce the margin of marketing costs and to increase consumption per head. The latter is being attempted by offering a quality product in an attractive manner and by educating the consumer to appreciate the nutritional value of the product.

Effect on Overseas Markets.

Efficient marketing is of special importance when the products are exported since in this instance entire markets may be lost through careless and inefficient methods. The decline in Australia's share of the citrus market of the Netherlands East Indies before the war in favour of the United States, South Africa and Singapore, is an example of such a happening. In this case, preference for the products of these countries was due to the greater uniformity of packing and grading, the greater sweetness and higher juice content as compared with the Australian product. The loss of this trade emphasis the fact that the consumer is the final judge, and, that every effort must be made to meet his requirements if the farmer is to obtain a maximum return for his efforts.

"RECORDS NEVER MADE A FARMER, BUT . . ."

IT has been said, and with a great deal of truth, that "Records never made a farmer, but good records are a great help to a good farmer."

During the past few years a considerable number of New South Wales farmers have realised this, and some, at least, have come to regard a satisfactory system of farm records as essential to the operation of their farm business.

However, there are many others who, unfortunately—both for themselves and for the general efficiency of Australia's rural industries—still adopt the old "hit and miss" method of relying on their bank account together with a miscellaneous collection of bills and invoices to give them an indication of "how they are doing." They continue to do this despite the fact that they know, or should know, that, because of their haphazard methods, they are often paying more in income tax than is legally necessary, and are certainly not getting the most out of their farm business.

All farmers may not aim at maximum farm profits but they all want at least a sound income which will ensure them a comfortable living. To be assured of a regular income in these days of changing conditions, fluctuating prices and varying market demands, the farmer must be something of a business man as well as an agriculturalist, and no business can be operated soundly and efficiently unless adequate financial and production records are kept. There are, no doubt, a great many farmers earning a good regular income who don't keep records, but the chances are that most, if not all, of these men could improve the income-earning capacity of their farms by improving their business through adoption of a sound system of farm records.

Why a Farmer Should Keep Records.

The following are the principal reasons why a farmer should keep records:—

1.—Adequate financial records are a legal necessity under income tax law.

2.—*Complete* records will often effect a considerable saving in income tax due to the fact that the farmer who relies on cheque butts, invoices and statements, etc., frequently overlooks many minor items of expenditure, which, although only small in themselves, amount to a tidy sum in the course of a year. Many farmers after keeping a farm record book for a year have expressed amazement at the total sum spent on small items, of which previously records had not been kept. Items for which cash

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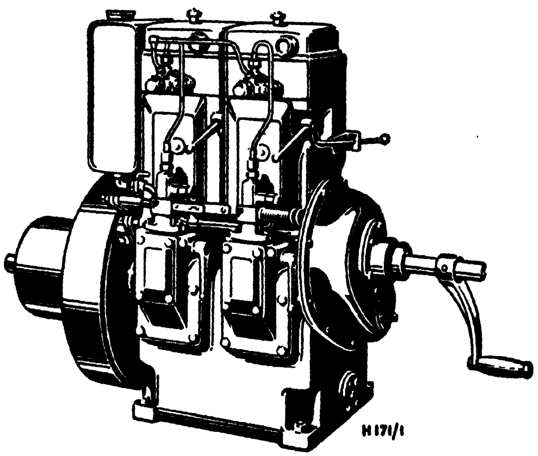

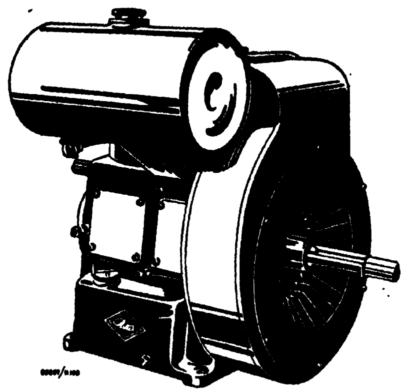

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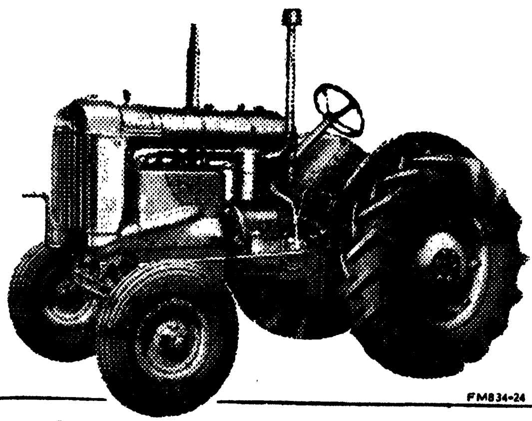

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is usually paid are the items that are overlooked or under-estimated in total. They frequently include such things as petrol and oil, small tools, minor spares, poisons, and sometimes sprays; in fact, anything that may be purchased from the grocer along with the family grocery order.

3.—Records make it possible to *ascertain accurately* the farmer's profit or loss in any one year. *This is rarely, if ever, possible when reliance is placed on cheque butts, bank statements and factory returns.*

To mention one point—profits ascertained loosely, without adequate records, invariably overlook changes in stocks of fodder, seed, fuel, fertiliser, building and fencing materials, and many other items. The variation in these items, seemingly unimportant, has frequently amounted to several hundred pounds in the one year on farms, the records from which have been examined by the Division of Marketing and Agricultural Economics. The year's profit or loss is therefore incorrectly stated by that amount.

4.—They enable the farmer to ascertain the return he obtains on his invested capital as distinct from the return for his own labour and management.

5.—Records enable him to compare his costs from year to year, and to note those costs which appear to be particularly high, or which may be increasing. This may frequently be a help in effecting reductions in costs which appear to be excessive. The very fact that a farmer realises that total labour costs, for example, represent 50 per cent. of his total costs, may bring him to realise that the efficient management of his labour force is of the utmost importance in reducing his costs to their minimum and, consequently, in increasing his profits.

6.—Records kept over a period of years prove a valuable source of information regarding prices paid and quantities of goods purchased and used in earlier years. This may often prove of practical use in that it enables the farmer to see at a glance the exact quantity of a particular product he used on a previous occasion, and this enables him to order the precise quantity required. This may often save both time and waste.

7.—Only by keeping adequate records can a proper cropping programme be planned and carried out. A sound farm rotation is part and parcel of a good farming system, increasing yields, and hence cash returns, and reducing the danger of soil erosion.

8.—A set of records will enable the farmer to budget from year to year with a reasonable degree of accuracy.

9.—A set of records will often enable the farmer to provide his local or State organisation with much valuable information if requested to do so. Such information is often very helpful to organisations of this kind in ascertaining production costs and in obtaining reliable information regarding the financial position of the industry. Of course the supplying of such information by the farmer is entirely voluntary.

10.—The value of a set of farm records will increase from year to year—the farmer will appreciate the benefits to be gained from them much more as time goes on.

11.—Under certain circumstances records will enable the farmer to determine his unit cost of production *and, in fact, unless adequate records are kept it is quite impossible to ascertain production costs under any circumstances.*

The Department's Farm Record Books.

For several years now the Department of Agriculture has published a series of Farm Record Books one or other of which is suitable for the great majority of farms in New South Wales. The records provided for in these books will give the farmer a complete set of financial and production records—if he keeps one of these books he needs no other records.

The books are available from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney, at a cost of 2s. 6d. each, post free. When ordering it should be stated which of the three undermentioned types of book is required. The books are suitable for:—

1. Wheat/Sheep Districts.
2. Dairying Districts.
3. Orchard and Vegetable Districts.

The Book Is Not Complicated.

On first sight the book may appear complicated; however, in fact, it is not, and the average farmer should have little trouble

(*Continued on page* 197.)

Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Sydney Royal	April 9 to 19
Gunnedah	April 26, 27, 28
Kempsey (C. H. Riggs)	April 26, 27, 28
Macksville (D. Turner)	April, 29, 30
Boggabri	April 29, 30
Horsley (J. A. Siggers)	April 30
Grafton (C. C. Pitt)	May 5, 6, 7
Narrabri	May 6, 7
Hawkesbury District (Clarendon), (T. J. Cambridge)	May 5, 6, 7
Orange (N. J. Aird)	May 5, 6, 7
Maclean (C. W. Done)	May, 11, 12
Albury Sheep Show (A. G. Young)	July 19, 20, 21
Condobolin	August 9, 10
Trundle	August 16, 17
Bedgerabong	August 20
Peak Hill	August 26, 27
Parkes	August 29, 30, 31
Grenfell	September 2, 3
Young (T. A. Tester)	September 6, 7
Forbes	September 9, 10
Cowra	September 13, 14
The Rock (O. L. Boyd and A. F. Walker)	September 17
Canowindra	September, 20, 21
Eugowra	September 27, 28
Albury (A. G. Young)	October 11, 12, 13

Approved Vegetable Seed April, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear that number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S.. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—*continued.*

Cauliflower—

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo-road, Dubbo.

Hunter River Brown (R.M. 47/12 and R.M. 48/4)—R. C. Morandini, Box 74, P.O., Dubbo.

Hunter River Brown (D.T. 48/2)—D. J. Thrift, "Linga Longa," Branxton.

Crystal Grano (R.M. 48/6)—R. C. Morandini, Box 74, P.O., Dubbo.

Early Barletta (R.M. 48/7)—R. C. Morandini, Box 74, P.O., Dubbo.

Tomato—

Pearson (Moscow) (H.R. 47/6 and H.R. 48/1) —H. P. Richards, "Sovereignton," Tenterfield.

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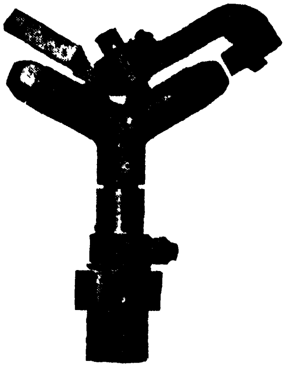

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A Planting Policy for the—

CANNING PEACH INDUSTRY

In the Murrumbidgee Irrigation Area.

THE VARIETAL ASPECTS.

(*Continued from Vol.* 59, *page* 254.)

B. OWEN FRENCH, B.Sc.Agr., H.D.A., Fruit Officer (Research) and
A. E. VINCENT, Fruit Inspector.

Part 2.—Field Data from a Variety Trial.

IN the previous instalments of this article, which appeared in the April and May, 1948 issues, the authors discussed the effect of the planting of canning peach varieties on the Murrumbidgee Irrigation Area, in accordance with the growers' need of high yields, without due consideration of factory capacity and requirements. Statistics of recent varietal plantings, estimates of future production and the processing problems associated with this concentration on several varieties were quoted and discussed.

The current instalment comprises observations made in a field trial with a number of imported and other varieties.

Source of Trees.

In 1935 at the instigation of Mr. W. Poggendorff*, a number of crossbred varieties of canning peaches were obtained from the United States Department of Agriculture. These varieties had been developed by Mr. W. F. Wight of Palo Alto, California, and in the introduction of the varieties the New South Wales Department of Agriculture agreed that the naming of them should be the prerogative of the U.S.D.A.

In the same year, Mr. W. Young of Kelvin Orchard, Ardmona, Victoria, received a similar collection of peaches from the same source.

Unfortunately, all varieties introduced by the New South Wales Department of Agriculture failed to propagate, but by arrangement with Mr. W. Young, further trees were successfully budded from the material he had obtained.

Many of these crossbreds have received local names in Victoria, but the New South Wales Department of Agriculture still feels bound by its original undertaking and consequently will recognise and use the names supplied by the United States Department of Agriculture. However, in those instances where there is no American name, the U.S.D.A. has agreed to permit the New South Wales Department of Agriculture to select a suitable one and in these cases it is intended to abide by the names used in Victoria.

The following table shows the list of crossbred varieties, the names used in the United States and Victoria and those accepted by the New South Wales Department of Agriculture.

Crossbred.	Name given by U.S.D.A.	Name used in Victoria.	Name recognised herein.
Leader Seedling No. 1 ...	...	...	Merinda.
Pratt-Low x Tuscan 21/1 ...	...	Kelvin ...	Kelvin.
Palora x Pratt-Low 37/54 ...	...	Young's Cling.	Young's Cling.
Palora x Halford I 22/38 ..	Cortez	Turnbull	Cortez.
Libbee x Lovell 35/31 ..	...	Warden ...	Warden.
Libbee x Newkom 22/27 ...	Tudor...	...	Tudor.
Hauss x Newkom 23/1 ...	...	Vincent ...	Vincent.
Hauss x Phillips 33/23 ...	...	Fairless ...	Fairless.
Lovell x Halford III 21/3 ...	...	Stanford	Stanford.
Phillip x Linden 37/29 ...	Ellis ...	Riley ...	Ellis.
Transvaal Yellow x Pullar 29/17A	...	...	Windra.

* Then Plant Breeder, Leeton Experiment Farm, now Chief, Division of Plant Industry.

History of the Trial.

In 1939, trees of the American crossbred varieties, plus trees of Transvaal Seedling were planted in the orchard of Messrs. Oag Bros. at Yanco. This planting was originally designed for preliminary investigation only and consequently was in no way randomised or replicated, but as the problems which have been outlined in the previous section of this article developed in the M.I.A. canning peach industry, attention was focussed on the results being obtained and it became necessary to develop recommendations from the limited experience of this investigation.

These trees are planted on a deep, red sandy soil of a type which is considered to be the most suitable for horticultural production and they have received adequate care and attention with respect to irrigation, fertiliser and pruning at all stages of their growth.

The trees of this trial first came into bearing in the season 1944-45, and detailed observations were made in the following years 1945/46 and 1946/47, with respect to tree growth, cropping habit and quality of fruit for canning. Particular attention was paid to maturity period, number of fruit carried after thinning, size of fruit, and the characteristics of the fresh fruit—called "field data." With the co-operation of the Council for Scientific and Industrial Research, the Leeton Co-operative Cannery, and Henry Jones Pty. Ltd., a number of trials were conducted to test the canning qualities of the fruit and these will be reported in a later section of the article.

With the industry's attention focussed on varieties it was inevitable that a number of seedling peaches and lesser known varieties should be brought forward for test. These were naturally growing under a wide range of conditions, but both field and canning observations were carried out on any which showed the slightest promise. As a result the canning qualities of Gaume, Palora x Halford 25/38 ex Herbert, and Seedlings (1), (2) and (3) were investigated, but as the trees are growing in different sections of the district on a wide variety of soils and under very different management the observations are not altogether comparable.

Size of fruit has been obtained by measuring the circumference of fifty fruits taken from the tree at random and converted to diameter on the assumption that the cross-section of the peach represents a perfect circle.

Observations on Varieties.

In this section we record field observations made at Leeton and compare them with those reported by Mr. R. S. Harper* for the Goulburn Valley.

Leader Seedling 1.—The growth of this variety is moderately vigorous and fruit matures from 6th to 17th January. The fruit is even in shape and has light yellow skin with a deep red blush over more than 50 per cent. of area. The flesh colour is light yellow but with a green tinge, and the centre is clear with a medium-sized stone. Its texture is tough and leathery, the flavour is poor and sour and its ripening habit is very uneven. The fruit is carried along the full length of the laterals but does not size very well. The average diameter of the fruit measured was 2½ inches and the number on the tree was 362, but even with thinning many small fruit were carried.

From our experience, which is in many respects similar to that reported by Harper, this variety would appear to be synonymous with Leader Seedling 26-13.

Pratt-Low x Tuscan 21/1 (Kelvin).—Trees of this cross are vigorous in growth and mature from 6th to 10th January. A deep red blush covers most of the skin area and the shape of the fruit is even. The flesh is coarse and leathery, of yellow colour with red flecks and streaks extending from the red centre and the stone is medium to large in size. Its flavour is poor and slightly sour. This peach ripens evenly but drops very readily at early maturity. The number of fruit on the tree was 217 which averaged 2⅝ inches but it has not carried a large crop although fruit buds are formed along the full length of the laterals.

Goulburn Valley experience has been somewhat dissimilar to ours in that Harper reports good flesh texture and small size of fruit with only slight red centre. It has apparently borne consistently, which would appear to conflict with M.I.A. experience of small crops as does the report of good hanging quality.

Palora x Pratt-Low 37/54 (Young's Cling.)—This variety matures its fruit from 8th to 19th January, is a consistent heavy cropper and of vigorous growth habit. The fruit is round and even in shape with skin a good yellow colour, with a red blush over half of area and is very smooth with little fluff. The flesh is yellow with a clear centre and small stone and texture is fine and juicy. Flavour is also good. Its ripening habit is even and the fruit hangs well after canning maturity. The crop is carried along

*R. S. Harper: "Some New Canning Peach Varieties"—*J. Dept. Agr. Vic.*, April, 1944.

the full length of the laterals and as the fruit set is high and there is some doubt regarding the ability of this variety to size, thinning is recommended. The trees under test carried 596 and 699 peaches with an average size of 2⅝ inches.

The only variation from Goulburn Valley experience in these trials is that Harper has reported slight red centre as against the clear centre observed in the M.I.A.

Palora x Halford I 22/38 (Cortez).—The growth of this variety was quite vigorous for the first seven years, but during the last two years its vigour has not been good and the trees are now fairly open and sparse of foliage, particularly in the lower half of the tree. The fruit matures between 20th and 30th January but is inclined to be small. It is round and even in shape with a red blush over 50 per cent. of skin, the flesh is pale yellow with a slight red centre and small stone. The texture is leathery but fine and flavour fair and slightly acid. The fruit hangs well on the trees but there is a large percentage of marked fruit. The trees carried 517 and 666 fruits with an average size of 2½ inches. It is a tip bearer and will require special pruning treatment to get the best crop. Rust outbreaks occur periodically on the M.I.A. and in the season 1947-48, which was a rust year, this variety showed high susceptibility to the disease.

Harper's report shows a slight difference in maturity, 16th to 21st January, and he does not mention a decrease in vigour with age of tree. With the further exception that he reports the peach as having a clear centre, M.I.A. and Goulburn Valley experiences are similar.

Libbee x Lovell 35/31 (Warden).—This fruit matures from 29th January to 7th February with tree growth vigorous and crops consistent. The fruit is medium to large in size, of good round shape with a slight bump similar to Pullars Cling. Its skin is yellow with a red blush over half the area. The flesh is yellow in colour with the stone which is small, very slightly red. The flavour is good and its texture crisp, open and juicy. The fruit hangs well on the tree but there is a tendency in some seasons for development of a percentage of split stones. The trees carried 396 and 571 peaches with an average size of 2⅞ inches. It is a tip bearer and would also require the pruning treatment for this type of tree.

M.I.A. experience differs from that reported by Harper only as regards maturity (which he states as being from 12th to 14th February) and texture of flesh (which he reports as being tough) while he states that the fruit tends to drop on reaching maturity.

Seedling 1 (*ex J. Morris*).—This peach is the earliest of the local seedlings in this test to

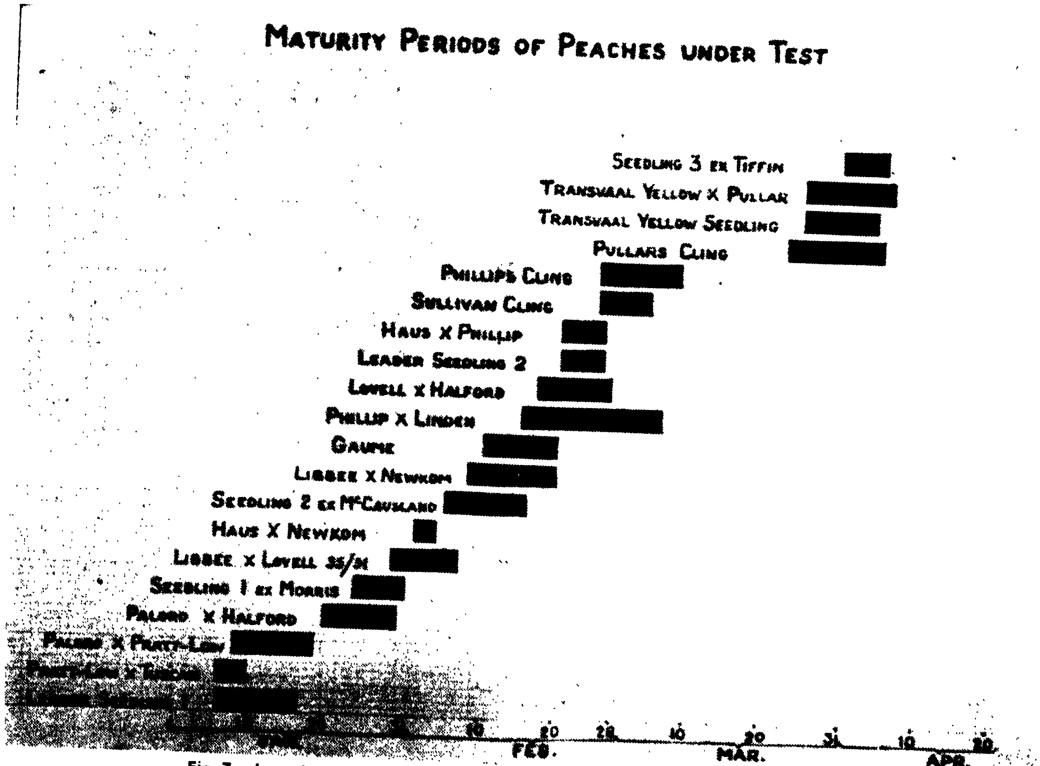

Fig. 7.—Length and Date of Maturity Periods of Peach Varieties Tested at Leeton.

mature, ripening from 24th to 31st January. It is fairly vigorous and a consistent heavy cropper of fruit which is long and slightly uneven in shape, cream in colour with a pale red blush over about 33 per cent. of surface. The flesh colour is cream with a large red stone and the texture is fine and juicy with a very good dessert peach flavour. The tree carried 529 peaches with an average size of 2⅞ inches. With the exception of its clingstone it is very similar in most respects to the Elberta variety.

Fig. 8.—Limb of Palora x Pratt-Low 37/54 showing Good Distribution and Size of Fruit.

Libbee x Newkom 22/27 (Tudor).—Maturing from 8th to 20th February, this variety is a fairly consistent cropper and vigorous in growth. The shape of the fruit is good and the colour is yellow with a red blush over 50 per cent. of skin surface. The yellow flesh is tough in texture with a slight red centre and a small stone. Its flavour is only fair and it has the disadvantage of falling readily. The average size of the fruit was 2⅞ inches while the trees carried 564 and 573 peaches. The bearing habit of this peach, being a pronounced tip-bearer, makes special pruning for crops necessary.

While Harper has recorded that this variety is susceptible to rust on the foliage only we have not observed similar infection. On the other hand, Harper makes no mention of undue maturity

Hauss x Newkom 23/1 (Vincent*).—This variety has produced vigorous growth and consistent crops of good-sized fruit, but its shape is slightly uneven wtih the Pullar bump. The skin is very furry with a red blush over 50 per cent. of the surface. The flesh is a good yellow colour with a slight red centre and with a stone of medium size. Its texture is crisp and juicy with a very good flavour. This variety also bears its fruit near the tips of the laterals. A disadvantage of this peach may be its very rapid ripening rate as all fruit would need to be harvested within a period of three to four days, its maturity period being from 1st to 4th February. The size of the fruit averaged 2⅞ inches while the trees carried 564 and 573 peaches.

Our experience with this peach has been very similar to that observed by Harper with the exception that he records the maturity date as being from 10th to 12th February. He also records that the pit is on the large side and that the blush is a speckled pink-red but these differences may not be significant.

Seedling 2 (ex McCausland and Ward).—Another of the local seedlings tested was this peach from Messrs. McCausland and Ward's orchard at Wamoon. It is similar in many respects to Phillips Cling in such characteristics as shape, colour of flesh and centre, but it matures from the 5th to 16th February, which is a little earlier than trees of this variety growing on the same block. It has a medium sized stone with flesh texture crisp, and flavour good, but it falls readily and its ripening habit is uneven. Fruit measurements were not made because the tree carried a very heavy crop, being neither pruned nor thinned.

Hauss x Phillips 33/23 (Fairless).—The growth of this variety is vigorous and fruit matures from 20th to 26th February. Its round, evenly-shaped fruit is yellow in colour with a red blush over about 25 per cent. of the skin surface. The flesh is close and crisp in texture, yellow in colour, slightly tinged with red round a medium sized stone and with a fair flavour. Carrying its fruit buds near the tips of the laterals it would also require special pruning treatment. The trees carried 220 and 250 peaches averaging 2⅞ inches in diameter.

There appears to be no difference between M.I.A. and Goulburn Valley experience with this peach.

Leader Seedling 2.—This Leader seedling is only moderately vigorous in growth. It is a consistent cropper, but fruit size is small. Its skin colour is yellow with only a very slight blush, flesh is yellow, slightly red at the centre and stone is medium sized. The texture is close and flavour fair. Fruit is carried along the full length of the laterals but the 482 peaches on the tree averaged only 2¼ inches.

Harper makes no mention of this variety.

Lovell x Halford III 21/3 (Stanford).—The trees of this variety in the test have produced vigorous growth and the fruit matures between

*The name "Vincent" has no association with the co-author of this paper.

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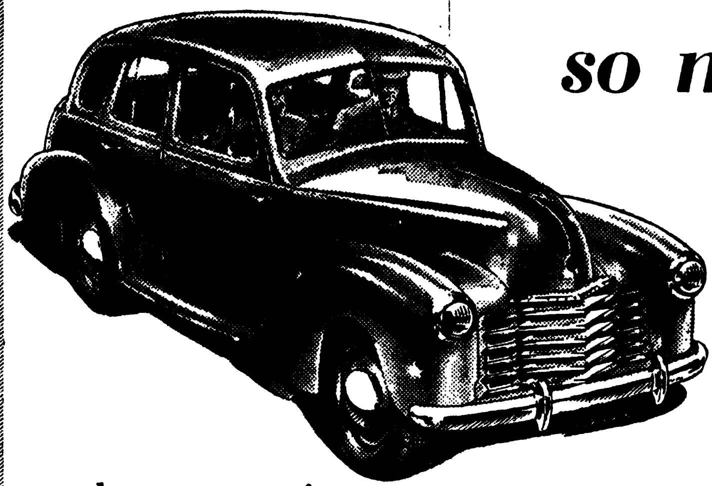

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17th and 27th February, but its ripening habit is rather uneven. The fruit is of good shape, yellow with a slight blush; flesh is yellow, slightly red at centre with a small stone. Texture is crisp but flavour is only fair. This peach averaged 2⅞ inches in diameter from trees carrying 268 and 349 fruit. Pruning of this variety is simplified because of good fruit-bud development along the full length of the laterals.

The only differences from Harper's observations are in respect of centre colour which he records as being clear, and hanging quality which he states was poor.

Phillip x Linden 37/29 (Ellis).—This variety is very similar, as regards shape, colour of skin and flesh, to Phillip Cling, one of its parents. It is a vigorous grower and matures its fruit from 15th February to 6th March, which is a very long period and is due to the very uneven ripening character of the variety. The flavour is only fair with a soft texture. It is similar to Phillip also in its bearing habit; that is, the fruit is borne near the tips of the laterals, but it differs from its parent in that its fruit shows a marked tendency to drop. Fruit size is inclined to be small, averaging 2⅜ inches diameter from 443 and 426 peaches per tree.

Harper has recorded a short maturity period for this variety, namely 16th to 18th February, but M.I.A. observations are in general agreement with regard to the fact that it closely resembles its Phillips' parent. He has also observed some difference in flesh texture which he records as being tough. However, the variations in Goulburn Valley experience which are of most significance are that it has been observed to hang well at maturity and that the fruit produces a proportion of split stones.

Sullivan Cling.—Six trees of this variety were planted at Leeton Experiment Farm in 1941 in heavier soil than the other varieties in the test and this may delay maturity by a few days.

The growth has been vigorous with good lateral production and fruit matures between 24th February and 3rd March. The fruit shape is good, skin yellow in colour with a slight pink blush, flesh is yellow with a slight red centre and stone-size is small. Its texture is fairly crisp and juicy with a fair flavour and size of peach quite satisfactory. The variety has a tendency to carry its fruit near the tips of the laterals and will require the pruning treatment for this type of bearing habit.

Harper does not record any observations regarding this variety.

Seedling 3 (*ex Tiffin*).—This is the latest maturing of the local seedlings tested, its maturity being between 28th March and 4th April. Shape is round, light yellow in colour with a red blush over half the skin surface. Flesh is close and crisp, yellow in colour with a red centre and a medium-sized stone and flavour fair. It does not hang well approaching maturity and its size is small in comparison with other late varieties.

Transvaal Yellow Seedling (Wight).—In 1934 the New South Wales Department of Agriculture imported seeds of Transvaal Yellow for breeding purposes from United States Department of Agriculture and South African Department of Agriculture. The seedlings were particularly uniform in all characteristics and after fruiting, buds were selected from the best for propagation. Three of the trees of this propagation were planted with the American importations in the orchard at Yanco.

Growth of this variety is very vigorous and dissimilar to other peaches in that the trees have a peculiar willowy appearance which is due to the long slender pendulous foliage rather than to dropping laterals. Another feature of the growth of this seedling is the production of abundant new laterals direct from the old wood. Bud development is good along the full length of the laterals, simplifying pruning. The fruit matures between the 24th March and 2nd April, and it is a consistant cropper of large-sized fruit. The peach is round and very even in shape with a deep yellow skin without any blush. The flesh is also a deep yellow colour with a clear centre and a medium-sized stone. The texture is firm, crisp and juicy with a very good flavour and the fruit hangs well to maturity with a noticeable absence of skin marks. Fruit size averaged 3½ inches diameter from three trees which carried an average of 363 peaches per tree.

Fig. 9.—Palora x Halford I 22/38 Tree, showing Loss of Vigour in Lower Portion of Limbs.

Transvaal Yellow x Pullar 29/17A (Windra).—This peach is also a late variety, maturing between 24th March and 5th April. It is a vigorous grower and produces abundant lateral growth which carry fruit buds along their full length. A characteristic of the variety is the pronounced short secondary lateral growth from fruiting wood. The peach is round and even, skin yellow with a slight red blush, flesh is a good yellow colour with a red centre somewhat less than Pullar, and the stone is of medium size. Its texture is fine and juicy with a very good, high flavour and its ripening habit is even, but in some seasons there is a tendency for a drop of fruit before maturity probably related to its Pullar parentage. Cropping has been consistent and heavy with very satisfactory fruit size, the average diameter being 3 inches from 427 and 755 peaches per tree.

Harper's observations relate to two lines of this parentage, viz., Yellow Transvaal x Pullars Cling No. 1 (29/12A) and Yellow Transvaal x Pullars Cling No. 2 (28/17A) with maturity dates, 20th March and 23rd to 26th March respectively. They are apparently similar in all other characteristics. M.I.A. experience is similar to that recorded by Harper and there does not appear to be any way of sorting out the difference in reference numbers, but it seems most likely that 28/17A and 29/17A refer to the same peach.

Gaume.—This variety was introduced by the New South Wales Department of Agriculture, from United States Department of Agriculture some years ago and planted at Leeton Experiment Farm and in the orchard of Mr. E. H. Smith at Yanco. Early experience gave reason for the belief that this peach was unduly susceptible to peach rust and as a result the trees at the Experiment Farm were destroyed. Those on Mr. Smith's property were reworked to another variety but a number of buds failed to take and the original limbs were allowed to grow and fruit. It is from this source that we have obtained fruit for the following observations.

The variety is vigorous in growth, crops consistently and matures its fruit between 10th and 20th February. Fruit shape is round and even, its skin is yellow in colour with a red blush covering about 50 per cent. of the surface. The flesh colour is deep yellow with a clear centre, the texture is crisp and juicy with a good flavour and a small to medium-sized stone. The size of fruit is very satisfactory, being all above minimum-canning size with more peaches than would normally be carried on each limb.

The season 1947-48 was a rust year but, despite the fact that no applications of fungicidal spray were made, incidence of the disease on these trees was negligible.

Recent information from the United States indicates that this variety is very popular in that country and a considerable acreage is planted to it.

Boyce.—This variety, introduced by Henry Jones & Co. Pty. Ltd. from South Africa in 1939 and planted on several farms on the M.I.A., is one of the most recent tested by the New South Wales Department of Agriculture. It is probably a South African variety which has been renamed.

Apart from its maturity period which is from 24th February to 4th March, it is very similar in all charcteristics to Transvaal Yellow Seedling and so shows considerable promise. However, the variety will need to be cropped for a year or two more before a definite statement can be made about it.

(To be continued).

Picking Pears for Cold Storage.

FOR longest storage, pears should be picked as soon as the fruit is fully developed, and while it is still hard and green to dark-green in colour.

At the correct stage, the colour of the skin will have lightened from the deep-green of immaturity to a uniform green colour. In the case of russeted varieties, the true colour of the skin can be ascertained after gently scraping off the surface layers. The firmness of the flesh, as measured with a standard United States fruit pressure tester fitted with a plunger 5/16 inch in diameter, should be between 15 and 22 lb.

At the optimum stage the fruit is easily removed, the stalk readily separating from the spur. Hormone-sprayed pears should be picked at the same time as unsprayed fruit, or even a little earlier, and over a shorter period and stored without delay.

At the correct stage for picking, the flesh, while still hard, will be showing some development of sugar and juiciness. When a fully developed pear is cut across there will be a slight exudation of juice on the cut surface; if the cut surface remains dry the fruit is probably immature. Change in the colour of seeds is not a reliable guide to maturity.

THE Minister for Agriculture (the Hon. E. H. Graham, M.L.A.) has announced that the annual "Diploma Day" at Hawkesbury Agricultural College, Richmond, will this year be held on Wednesday, 4th May, when the prizes and diplomas gained by successful students during the past year will be presented. The presentation of the prizes and diplomas is to be made by the Premier of the State, the Hon. J. McGirr, M.L.A.

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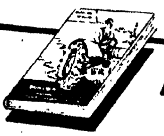

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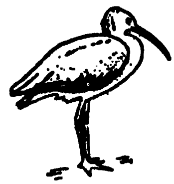

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42% $CaCO_3$

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Neutralising Value 78

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MECHANICAL MEASURES FOR—
CONTROL OF SOIL EROSION
On Central Coast Citrus Orchards.

(*Continued from page* 129.)

K. D. McGILLIVRAY, Fruit Officer.

LARGE quantities of water are at times precipitated by storms on to central coast citrus orchards. The control and efficient disposal of this water so as to make the most use of it and to avoid damage by erosion of soil are very important aspects of orchard management in this area.

The first portion of this article, which appeared in March issue, discussed the over-all planning of the property in order to prevent erosion, and this concluding portion gives details of the design and construction of waterways.

Waterway Design.

A wide, shallow, grassed waterway, level in cross-section (Fig. 7), is recommended for two main reasons.

1. As the depth of water increases, so does its velocity and ability to damage the soil surface.

2. Grass forms a better sod on a shallow waterway covered with top soil, than on narrow drains cut deeply into the subsoil.

A decision must be made as to what can be spent on protection. It is hardly necessary to mention that there are economic limits to expenditure on most kinds of protection or insurance.

After careful examination of the data, and as a result of experience, a waterway has been designed against the "once-in-five-year" storm, that is the worst storm that may be anticipated once in five years. It has a good margin of depth to meet the storm of higher intensity which is likely to occur over a greater number of years.

Orchard areas are small and periods of concentrated rainfall are short. The heavy downfall will seldom be of more than 14 minutes duration, and soil management practices and design of banks should cater for these concentrations. An hourly rate of fall of 4.66 inches can be anticipated for the once-in-five-year storm of 14 minutes duration at Gosford.

An Example of Waterway Design.

A 10 acre citrus block on a 7 per cent. slope at Mangrove Mountain drains into a waterway which is 11 feet wide. Has the waterway sufficient capacity?

The rate of fall 4.66 inches per hour is equal to an intensity of 4.66 cubic feet per second (cusecs). Allowing for 50 per cent. run-off a flow of 2.33 cusecs per acre results. The rate of flow from 10 acres would be 23.3 cusecs.

Mr. A. W. Miller, in the *Journal of the Soil Conservation Service of New South Wales*, July, 1945, states "A good grass cover can withstand water flowing at a speed of 5 feet per second without serious damage, and if the cover is particularly good velocities as high as 8 feet per second for short periods may not cause much serious harm."

The steeper the slope the faster water flows; depth too, increases the speed of flow (velocity). If the rate of run-off is known, a waterway can be designed on a particular slope, to keep the depth within safe limits by providing sufficient width.

It will be seen from the accompanying table that when the depth of water on the grass on a 7 per cent. slope is .44 feet (5¼ inches) the velocity is 5 feet per second. The capacity of a waterway in cusecs is equal to the cross-sectional area multiplied

by the velocity. In the block under consideration:—

Cross-sectional area in sq. ft. = 11 (width) × .44 (depth of flow) = 4.84 sq. ft.

Capacity = 4.84 × 5 = 24.2 cusecs.

Therefore the waterway capacity can take the expected flow of 23.3 cusecs. This does not mean that the waterway should be constructed only 5¼ inches deep. Banks on each side should be about 18 inches high to provide a margin for the exceptional storm.

Fig. 6.—A Small Orchard Waterway Well-covered with Rhodes Grass.
Mr. Turvin Studd's Property at Somersby.

*Depth at which Velocity of Water Flowing in a Grassed Waterway Will Reach 5 Feet per second.**

Grade.	Depth of Flow.
2 per cent. or 1 in 50	1·10 feet or 3¼ inches.
3 " or 1 in 33	0·82 " or 10 "
4 " or 1 in 25	0·65 " or 7¾ "
5 or 1 in 20	0·56 " or 6¾ "
6 or 1 in 16	0·49 " or 6 "
7 or 1 in 14	0·44 " or 5¼ "
8 " or 1 in 12	0·39 " or 4¾ "

* From the *Journal of the Soil Conservation Service of N.S.W.*

The necessary width of waterway for an area of orchard can be found by dividing the expected flow in cubic feet per second by the product of the depth and speed of flow. Applied to the property being considered this formula is:—

$$\frac{23.3 \text{ (cusecs)}}{.44 \text{ (from table 1)} \times 5 \text{ (ft. per sec.)}} = 11 \text{ feet.}$$

Waterway Construction.

Small orchard waterways 6 feet to 15 feet wide can be constructed with the average orchard tractor and a grader-ditcher.

A space about 18 feet wide should be pegged out for a 10 feet waterway. With the ditcher blade set at its most acute angle (its narrowest cut) proceed as shown in the diagrams (Fig. 8).

The finishing is done with light horizontal cuts to give the desired flat bottom, level in cross section. It will be noted that the bottom is covered with surface soil. A straight edge and a carpenter's level can be used to check the levelling of the surface.

Large waterways should be checked with an engineer's level and staff.

Grassing a Waterway.

Sowing with grass follows as soon as possible after construction is completed. It is important that surface soil should be scattered over the bottom as shown in the diagrams.

A suggested procedure is as follows:

1. Spread fertiliser over the bottom and banks. Superphosphate alone is not sufficient. Blood and bone and superphosphate or citrus mixture at the rate of about 4 cwt. per acre is recommended.

2. Cultivate the level surface with a disc harrow or other implement.

3. Spread 1 ton per acre of dolomite.

4. Sow seed on level surface and banks and harrow lightly.

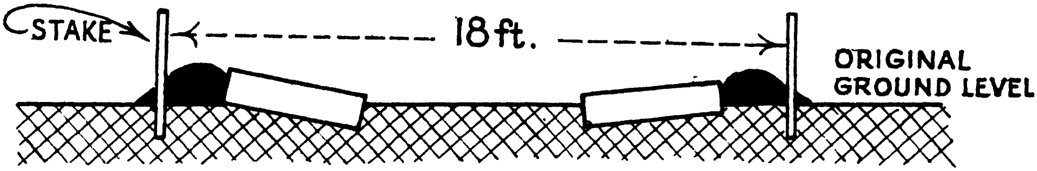
5. Make sure that the only water that can enter the waterway is rain that may fall on it.

Strips of grass sod or bags of soil with grass seed placed across the waterway at intervals are recognised as helpful in establishment. When in place they should be only slightly higher than the surface.

Rhodes Grass and Red Clover.

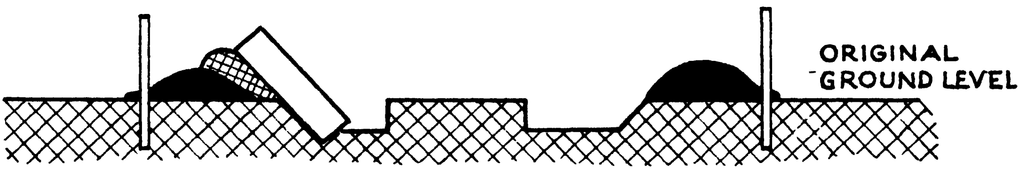
The establishment of a plant in a waterway which is likely to become troublesome in the orchard is something to avoid. Kikuyu grass is not recommended for this reason. Not having any ambition to suggest a plant for waterway protection which may become known in the orchards as McGillivray's Curse," some careful enquiries were made. All enquiries to date have favoured Rhodes Grass. No trouble has been experienced on a property where it has been growing for more than six years beside cultivated land; other similar experiences have been noted. It is a good "pioneer" plant and forms a water-resisting sod. A perennial, it creeps on the surface but does not grow from underground stems like couch and kikuyu.

To get the best results good seed-bed preparation is recommended. Sown as a crop to do a specific job it is worthy of good treatment because it does the job well.

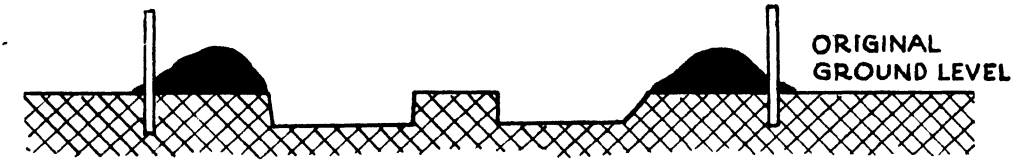


First Cut. *Second Cut*

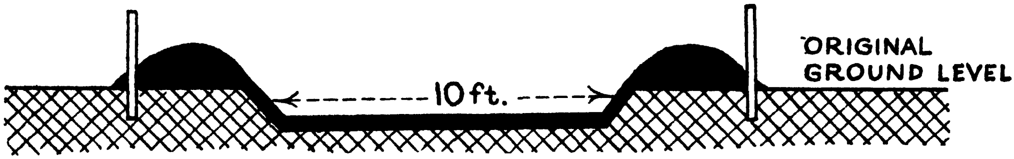
After the first and second cuts continue as though ploughing moving soil to the banks.



One or two cuts with the blade at a steep angle will give height to the bank and crowd the soil together, as above.



When there is only a "bone" of undisturbed soil in the centre as above, set the ditcher blade at right angles to the pull and scatter the "bone" over the surface of the waterway.



The Finished Waterway.

Fig. 7.—Construction of a Small Orchard Waterway.

The sowing rate is about 6 lb. per acre, the price about 1s. 9d. per lb. The addition of 3 lb. of Red clover per acre will help the grass by raising fertility. Having established a good sod of grass it should be maintained by top-dressing and repaired promptly if damaged.

Fig. 8.—A Grader-ditcher at Work Constructing Drainage Banks.

Mr. J. Aalto's property at Kulnura.

A Grader-Ditcher Does Many Jobs.

A small grader-ditcher costs about £60, but several are available for hire at about £1 per day in the Gosford district. They can do many farm jobs in addition to constructing waterways and graded drainage banks. These include grading up farm roadways, cutting deep ditches for underground drains, filling stump holes and cutting down mounds.

The writer's experiences—mainly in sandy coastal highland soils building banks and waterways—may help to an understanding of what a grader-ditcher can do and what it should not be expected to do. An early appreciation of the need for well-constructed banks led to a quest for a ditcher. The only one to be found in the whole district had been wrecked in an attempt to construct a drain through uncleared, stony land behind a fair sized bulldozer!

The grader-ditcher is sufficiently light to work with wheeled orchard tractors and rugged enough to handle a blade full of soil behind a small crawler-type tractor—the ideal power unit to work it to full capacity.

Stumps, stones and roots are fairly plentiful in some of the land which, it is alleged, has been cleared with bulldozers. To avoid discomfort when the blade strikes an obstruction it is advisable to use the new ditcher with a tractor release. This saves damage to the machine and has other obvious advantages.

Operating a Grader-Ditcher.

Most orchard tractors can be "bogged" in the sandy coastal highland citrus soils by unskilful operation of the ditcher; overloading soon starts wheel spin. The time taken to get the tractor out after it has dug itself in can be spent better in making lighter cuts and keeping the soil flowing off the blade.

Big banks cannot be built in one operation with the average orchard tractor and a grader-ditcher. The tractor must work on the bank of loose soil to make the steeply tilted cuts required to give height to a big bank. With care, cuts of this nature can be made, but attempts to move a blade full almost always results in a "bogged" tractor. Some fairly large banks, at the maximum vertical interval have been built in this area. Ample channel capacity has been provided by construction with crawler tractors.

The small banks needed for most waterway and graded bank construction are within the capacity of most orchard tractors, although it is rather slow work with the smallest types.

The best working position for the ditcher in sandy soil and with small orchard tractors has been found to be the most acute angle. This gives a minimum width of

(*Continued on page* 197.)

WHAT TO DO

in your orchard . . .

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CITRUS

Red Scale—Spray with Neptune White Spraying Oil.
Pink and White Wax Scales—Spray with Neptune White Spraying Oil and Washing Soda.

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While pruning, watch for San Jose, Mussel and other Scales, also Red and Bryobia Mites, Woolly and other Aphids, etc. . . . and **ensure dormant control** of pests by ordering now your requirements of the following Neptune Sprays—

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PREPARED RED SPRAYING OIL 'A' and 'C'
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SAN JOSE SCALE: *1—Adult Male Scale. 2—Adult Female Scale (both greatly magnified). 3—Scales on pear, indicating red discoloration.*

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Full details of this new product will gladly be supplied by all Masonite distributors.

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PLANT DISEASES

SQUIRTER AND BLACK-END DISEASES OF BANANAS.

A NEW regulation has been proclaimed under the Plant Diseases Act, 1924, to assist in overcoming the losses the banana industry suffers from these diseases.

The regulation, which becomes operative on 1st May, requires that fruit shall not be sold in New South Wales between 1st May and 30th November each year unless:—

(*a*) the bananas have been treated with or dipped in a fungicide containing salicylanilide, the concentration of the fungicide and the manner of treatment or dipping being sufficient to kill *Nigrospora sphaerica*, the cause of Squirter disease in bananas; and

(*b*) the package containing the bananas is marked with the name of the fungicide, followed by the word "treated" or "dipped" as the case may be.

Squirter disease is a dark, watery rot of the pulp of the fruit, which commences to develop during the ripening process and proceeds further while the fruit is in the retailer's shop and the home of the consumer.

The disease is caused by the fungus *Nigrospora sphaerica*. The spores of this fungus are plentiful in many, if not most, plantations, and during packing may come in contact with the broken stem-end of the

Left.—Section of a Banana affected with Squirter Disease.

Centre.—Fruit from Case Dipped in Salicylanilide.

Right.—Banana affected with Black-end Disease.

fruit. The spores germinate and the fungus mycelium grows down the stem of the fruit and attacks the pulp, ultimately converting it to a semi-liquid condition.

Squirter is most prevalent during the cooler months of the year, but it occasionally occurs in mid-summer. Its winter prevalence is partly accounted for by the fact that the ripening process of fruit is longer during the cooler months of the year, and ripened fruit is held longer in shops and homes, giving the fungus a greater period of activity. Further, fruit that has been chilled, either in the plantation or after packing, is apt to present difficulties in ripening and is very prone to develop squirter during the extended ripening period.

Black-end disease is a rot or discoloration of the stem of the fruit caused by a number of different fungi, the most important of which are *Nigrospora sphaerica, Gloeosporium musarum* and *Fusarium* spp. As in the case of squirter, the fungi gain entrance through the broken stem-end, and the percentage of infected fruit in a consignment is to some extent an indication of the amount of injury the fruit has received during packing.

Fruit from certain classes of soils and from plantations of high altitude is particularly susceptible to black-end. Fruit that has been chilled usually develops a high percentage of black-end during the extended period necessary to ripen chilled fruit.

Control Measures.

Control of squirter and black-end may be obtained by the simple process of dipping the cased fruit in a fungicidal solution after packing. By far the most satisfactory fungicide for this purpose is salicylanilide or its compounds. These may be purchased under the trade names of Shirlan A.G. (25 per cent. suspension of salicylanilide), Sali-cide Banana Dip and Shirlan W.S. (sodium salt of salicylanilide).

Shirlan A.G. should be used at the rate of 1 pint in 30 gallons of water. The fungicide should be well stirred before removing from the tin. Sali-cide Banana Dip should be used at the rate of ½ lb. in 25 gallons of water. Shirlan W.S. should be used at the rate of ½ lb. in 30 gallons of water. The powder should be first stirred to a cream before adding to the water. With Shirlan W.S. a wetting agent (Agral 2 or 3, or Wetsit) should be added. With Shirlan A.G. and Sali-cide Banana Dip this is unnecessary as a wetting agent is already incorporated.

In dipping fruit care should be taken to dislodge airlocks in papered cases by raising and lowering the case a few times. Every five cases absorb about one gallon of dipping solution, so that provision for replenishing the vat should be made.

Fresh dipping solution should be prepared on each day of use, as it is subject to decomposition and loses its efficiency.

Time of dipping is a half minute or less, and the case is then allowed to drain. The cost of dipping is small when it is considered that it will eliminate squirter and greatly reduce black-end, thus improving the sales-value of the fruit.

Cool Storage for Gladiolus Corms.

GROWERS who wish to plant an autumn crop for late blooms may find it necessary to cool store the corms to retard shooting.

The best temperature for storage is in the vicinity of 40 deg. Fahr. The storage temperature should not go above 50 deg. Fahr. or below 32 deg. A relative humidity of 75 per cent. is the most satisfactory. Under these conditions corms can be stored up to 8 to 10 months, possibly longer.

Before storing, the corms must be thoroughly dried out and may be dehusked or not, as desired.

Cool storage space can be rented from a number of firms, the charges being about 9d. per bushel case for the first week, and 3d. per week thereafter for storage at 34 deg. Fahr.

Cool storage has the additional advantage that it effectively breaks the dormancy period. Corms which have had a period of storage not less than 3 to 6 weeks (the period varies slightly with the variety) will shoot at once on planting out and the resulting stand is very even.

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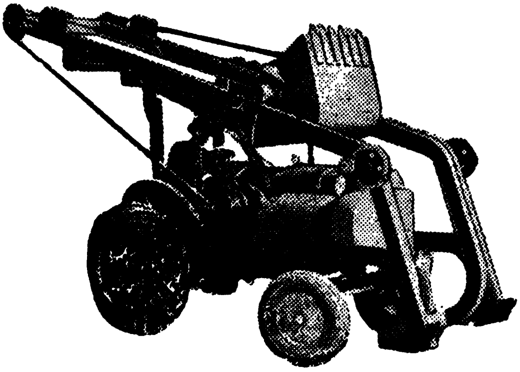
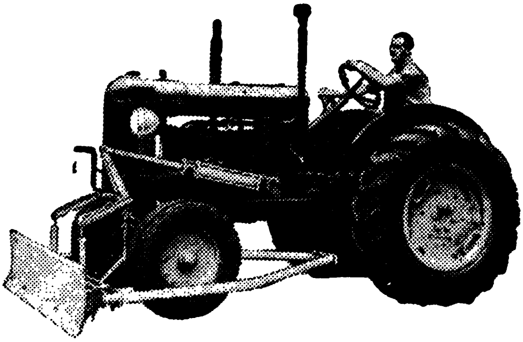
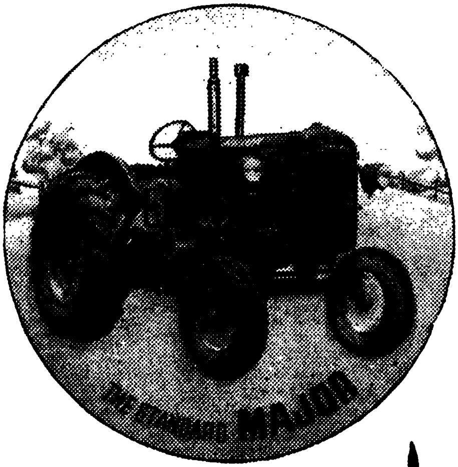
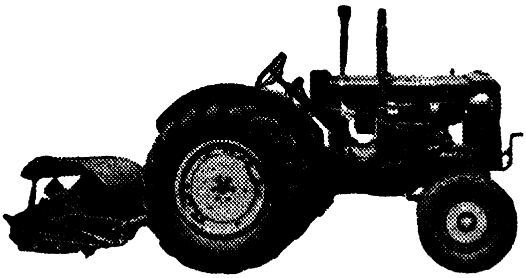


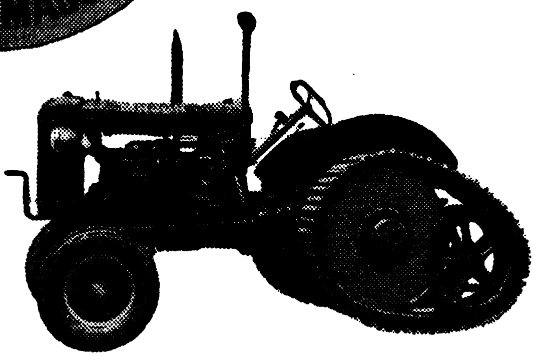


Above: *The "Motrac" Mobile Overhead Loader* scoops the material — handling field. Designed to handle a wide range of materials, this labour-saving device fitted to a Fordson Major Tractor will perform efficiently under all conditions.



Above: *The "Gagie" Farm Dozer* — ideal machine for the farmer — may be attached to or removed from your tractor in less than 5 minutes. Light but strong, the "Gagie" is capable of dozing up to 2 tons of earth.





Above: *The Howard Rotary Hoe* — can now be fitted to your Fordson MAJOR tractor. Turning a 4 ft. 6 in. width of cut, the Fordson MAJOR and Rotary Hoe make easy work in preparing all types of cultivation: easy to attach, easy to detach.

Above: *The Fordson Major Roadless Tractor* broadens the field of tractor operations. Difficult farm lands can be successfully mechanised with the aid of this Roadless version of the Fordson MAJOR—a glutton for heavy work on soft ground, sandy soil and steep grades.

If it's a MAJOR task it's a task for the " MAJOR "—See your Fordson Dealer.

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SHELL WHITESPRAY.

A foliage or summer pre-emulsified spraying oil containing a highly refined oil for the control of red and other scale pests of Citrus; Codling Moth and Light Brown Apple Moth; (in combination with lead arsenate), Red Spider, Mites, etc., on Apples and Pears.

SHELL REDSPRAY.

A miscible or soluble spray for use in the dormant season on Deciduous trees for the control of Red Mite, San Jose Scale, Woolly Aphid, etc., etc.

SHELLESTONE.

This is a plant hormone spray for the control of pre-harvest drop of Apples and Pears. Whilst preventing the premature drop of fruit, Shellestone will not delay maturity.

SHELL PALESPRAY.

This is a pre-emulsified dormant spraying oil and is used for the same purpose as Redspray, but has additional advantages over the conventional type red spraying oils in that Palespray can be used in combination with bordeaux and lime sulphur and mixes readily in hard water.

Shell Palespray is the ideal dormant spray, and gives higher oil deposits on the tree, thus obtaining more efficient control of Red Mite, San Jose Scale, Woolly Aphid, etc., etc.

SHELLICIDE "D."

A semi-dormant pre-emulsified spraying oil containing a more highly refined oil than even pale or red spray, and can be used in combination with bordeaux or lime sulphur up to the pink stage of Apples.

Shellicide "D" acts both as a spreader and more particularly as a sticker, leading to more uniform and more permanent cover of the fungicide. Shellicide "D" is the ideal "in-between seasons spray" and mixes readily in hard water.

SHELL APHIS OIL.

A recently introduced but highly successful spray. Shell Aphis Oil is a product combining the insecticidal effects of D.D.T. and petroleum oil emulsions. It is specifically designed for use on Peaches, Cherries and Nectarines in the late dormant period, to control both Green and Black Peach Aphid and Black Cherry Aphid. It is a pre-emulsified concentrate and is miscible in hard water.

SHELL UNIVERSAL D.N.C. WINTERSPRAY.

A dormant spraying oil which contains a potent organic insecticide—dinitrocresol—and is primarily designed for control of the tough over-wintering eggs of the Green Peach Aphid and Black Cherry Aphid, and also provides simultaneous control of San Jose Scale and Red Mite on Peaches and Cherries. This spray mixes readily in hard water, and does not burn the hands or face.

All available in 4-gallon tins or drums (according to availability or packages) and 44-gallon drums.

The Shell Company of Aust. Ltd. (Incorp. in Great Britain)

There is no experimental evidence to show whether or not the chemical treatments of corms recommended for the control of diseases of gladioli should be applied before or after cool storage. However, it is thought that treatment before storage would not be injurious and that it would help to prevent deterioration of the corms due to attack by moulds such as *Botrytis*. It is most important that the corms should be thoroughly dried out if they are to be treated with chemicals prior to storage.

The Cause and Prevention of Poor Stands in Pea Crops.

POOR stands in pea crops are often the result of attack by soil-inhabiting fungi. This can be prevented and stands increased by treatment of the seed with fungicidal dusts.

Many growers have found that, when cool, moist conditions immediately follow the sowing of pea crops, germination is often unsatisfactory and, as a result, the stand is very considerably reduced. This loss is actually due to the rotting of the seed by soil-inhabiting fungi before, or just after germination. The attack of these fungi is most severe when emergence of the seedlings is delayed by low soil temperatures or when the soil moisture is high. Often, the grower is not aware that these fungi are present in the soil till a considerable loss has been sustained.

Experiments carried out by this Department and overseas have shown that treatment with any one of a number of fungicidal dusts will protect the germinating seed and, consequently, result in a much better stand being obtained.

A Flat planted with Peas, showing how dusting the seeds protects them from "Pre-emergence" Damping-off. The same number of seeds were planted in each row.

Various proprietary brands of dust available on the local market can be used for this purpose. The dusts fall into three groups:—

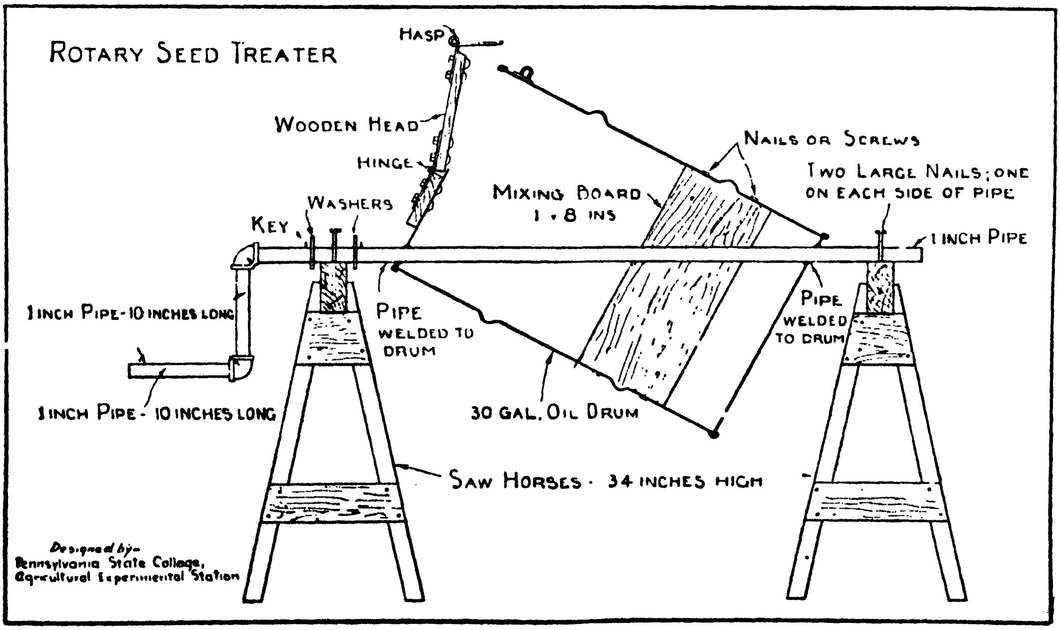


Diagram of a machine suitable for dusting large quantities of seed.

1. *The Copper Oxychloride Fungicides.*—These include "Bunticide," "Cuprox," "Oxicop," "Saltosan" and "Smutol." These dusts should be used at the rate of 2 oz. per bushel. They are recommended where it is intended to hand sow small areas such as the home garden.

2. *The Organic Mercurial Compounds.*—These are "Agrosan" and "Ceresan" which can be used at the rate of 1 oz. per bushel. Either of these dusts is suitable where it is intended to machine-sow large areas which have previously been cropped to peas, and it is not intended to treat the seed with nodule-producing bacteria.

3. *The Non-Metallic Compound "Tetroc."*—This is recommended for use at the rate of 1½-2 oz. per bushel. "Tetroc" is of special value to the large-scale grower as it is less harmful than other seed protectants to nodule-producing bacteria. Thus, for large areas where peas have not previously been grown, and it is intended to treat the seed with a bacterial culture, this latter operation can safely be carried out after the seed has been treated with "Tetroc." Another advantage of "Tetroc" is that it lubricates the seed and facilities seed flow through the drill, thus avoiding any clogging or cracking of the seed in the drills.

Method of Treatment.

Large quantities of seed can be treated by rotating in a drum suspended on a diagonal axis and fitted with a mixing board (see diagram).

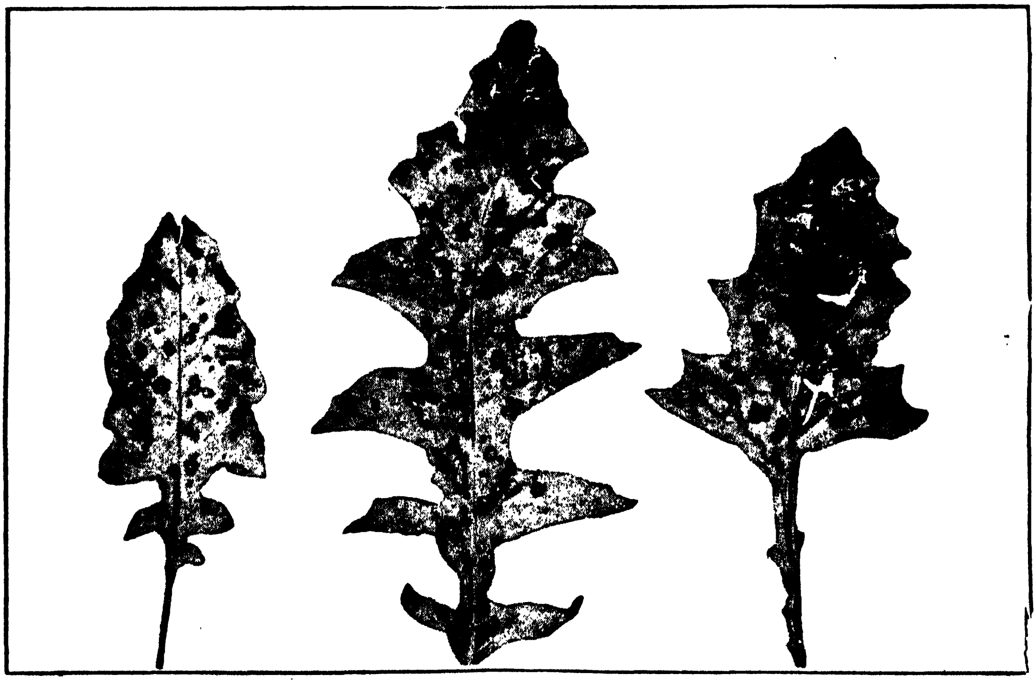
For small sowings, the seed and the dust can be placed in a glass jar or other lidded container and shaken vigorously until a thorough coating of dust has been obtained. Excess dust can be removed by running the seed backwards and forwards over a sheet of newspaper.

Leaf Spot of Gerberas.

LEAF SPOT of gerberas is often quite conspicuous during late summer and autumn. The disease is more commonly caused by the fungus, *Cercospora* sp., but *Septoria gerberae* has been isolated in some instances.

Symptoms.

In the case of Cercospora leaf spot, the infected areas on the leaves vary in size from that of a pin's head to ¼ inch in diameter, but where infection is severe it is



Cercospora Leaf Spot of Gerberas.

common to find that several spots have merged, resulting in browning and death of large areas on the leaf surfaces.

The individual spots may first appear brownish or blackish purple in colour, but with age they develop ashen grey or brown centres surrounded by a dark ring. Examination with a magnifying glass reveals the presence of tiny black specks in the centres of the infected areas; these bodies are the fruiting or spore-bearing structures of the causal fungus. The spores are blown by wind to other plants where, in the presence of moisture, they germinate and infect the leaves.

In the case of Septoria leaf spot, large purplish-black blotches appear on the foliage, often resulting in death of several leaves on the one plant.

Control Measures.

Seed should be saved from clean plants only, and plantings of either seed or plants should be made in clean soil.

As soon as the slightest trace of leaf spot appears, the plants should be sprayed with Bordeaux mixture (4-4-50), or with copper oxychloride ("Cuprox," "Oxicop" or "Soltosan") 1 oz. to 2½ gallons of water. The addition of 1 fluid oz. of white spraying oil per gallon of spray mixture is desirable as it improves the adhesive properties. This procedure should be repeated at intervals of about two to three weeks As far as possible, the spray should be directed on to both surfaces of the leaves.

In the case of plants showing the disease in severe form, it is important to remove and burn all infected leaves before applying the fungicide.

To make 3 gallons of Bordeaux mixture of this strength, dissolve 4 oz. of bluestone in 2 gallons of water. This can be done quickly by using a little hot water. Use only a copper, wooden, or earthenware vessel for the bluestone. Slake 4 oz. of quick lime with a small quantity of water and make up to 1 gallon. If hydrated lime is used, half as much again will be required. Pour the lime mixture through a fine strainer into the bluestone solution, stirring all the time. Use fresh.

Business of Farming—*continued from page* 181.

in keeping at least the major financial records. It must be remembered that each of these books is designed to cover all farms of a particular type in New South Wales and consequently there will be some entries and columns, and perhaps whole sections, which will not apply to your farm. Do not let this deter you from using the book; these sections may be ignored.—P. C. Druce, Economics Research Officer.

Fruit Growing—*continued from page* 192.

cut, free movement of soil along the blade and therefore lighter draught.

Most of the writer's work has been done with the ditcher stripped of the seat and castor-wheel. The castor-wheel has theoretical advantages, but in practice close coupling of the beam to the tractor without a chain or link gives the best results.

Preservation of crop material as silage is actually a pickling process similar to preservation of pickled onions or gherkins in vinegar, points out the Division of Plant Industry of the Department of Agriculture. The main preserving medium is lactic acid, although acetic acid (the acid present in vinegar) is also found in reasonable concentration in the finished product. These two acids are produced by the activity of bacteria present on the greenstuff when it is carted in from the paddock and always present in sufficient numbers to bring about fermentation.

FIELD BEAN IMPROVEMENT.

Two Projects Being Undertaken.

A. C. ORMAN, H.D.A., Special Agronomist.

THERE has been a serious decline in the production of field beans in the New England district since the war, owing chiefly to the increasingly heavy losses caused by American Common Blight (*Xanthomonas phaseoli*). Whereas during the war the area reached approximately 12,000 acres, which was insufficient to satisfy Australia's annual requirements estimated at 3,000 tons, only about 4,700 acres were sown in the 1947-48 season for an estimated yield of 300 tons.

It will thus be realised that a valuable industry, both economically and agriculturally is threatened with extinction unless this disease can be effectively controlled, and growers returns stabilised at a profitable level.

The Division of Plant Industry is tackling this problem in two ways:—

(1) By developing, in co-operation with the Biological Branch, disease-free foundation seed of improved strains, to form the nucleus of a commercial seed production programme; this, of course, must be regarded as only a temporary expedient:

(2) By breeding disease-resistant varieties of good agronomic quality; this is a long range project designed to provide a permanent solution to the problem.

Disease-free Seed.

This project was commenced at the Leeton Experiment Farm in 1946, and the Department has supplied the Navy Bean Marketing Board with 200 lb. of apparently disease-free seed, comprising strains of the small White Michelite varieties, for use as foundation seed. Further selection work with these varieties is being undertaken at Leeton.

Breeding.

As no information was available regarding the relative resistance of bean varieties to American Common Blight, arrangements were made for preliminary tests for disease resistance to be carried out, and in this connection the co-operation of the Council for Scientific and Industrial Research and Biological Branch was obtained. Bush and pod inoculation tests showed Red Mexican U-1.3 and Michelite to be resistant to Halo blight and Blue Pod and Blue Wonder resistant to American Common Blight.

Accordingly, on the basis of these tests the following crosses were effected at Hawkebury Agricultural College last season:—

Blue Wonder x Michelite, Blue Wonder x Small White, Michelite x Blue Pod, Blue Pod x Small White, Red Mexican x Tweed Wonder, Red Mexican x Brown Beauty.

Arrangements have been made with the Council for Scientific and Industrial Research for the testing of the progenies of these crosses for disease resistance, so as to be certain that the selected crossbreds possess this desirable characteristic.

Although disease resistance is the main objective at present the necessity for varieties to possess other characteristics such as earliness, erectness, dwarf habit, uniform maturity and resistance to shattering is being kept in mind.

EXCEPT in areas handicapped by insufficient rainfall, the top-dressing of pastures in New South Wales with superphosphate has an important bearing on the productivity of sheep.

By providing grasses and other pasture plants with food in the form of fertiliser, quality of growth is greatly improved. Superphosphate stimulates growth and seed production of legumes, which are extremely valuable plants in a pasture. The amount of mineral matter in the pasture is thus increased, particularly the elements lime and phosphorus, which are essential for health and development of the animals. Where there is a marked increase in lime content, the percentage of nitrogen in the pasturage is also increased.

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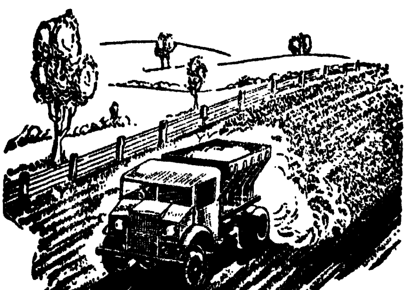

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INSECT PESTS.

Notes contributed by the Entomological branch.

FORECASTING INSECT PLAGUES.

FORECASTING insect plagues is not always an easy matter and requires the co-operation of meteorologists and ecologists, as well as entomologists, who study the environment, feeding habits, and other factors, all of which have their influence on insect numbers. To carry out this work extensively would involve special study, and require considerable personnel. Our present knowledge of the occurrence of insect pests is largely based upon observations made by entomologists over a number of years in the ordinary course of their particular duties.

Most insects have their favoured environments, and if the particular food requirements and climatic conditions involved are determined, it is often possible to state whether an insect will thrive in any given locality. On a similar basis it is possible to explain seasonal differences in numbers of various pests, and often to suggest the possibility of the development of a plague or an unusually severe outbreak of some particular insect.

Seasonal Influence on Pest Incidence.

The past spring season was notable for the widespread plague of black aphids. These are known to follow unusually prolific herbage growth resulting from good, late-autumn, winter and early-spring rains. It is also well known to graziers that evenly distributed, and reasonably high rainfall at particular times, results in increased sheep blowfly activity. Graziers, in areas where breech strike can be particularly troublesome, can under these conditions normally anticipate fly waves, whereas in dry seasons the incidence of fly strike is negligible.

In a general way, it is considered that a hot, dry season favours development of such pests as codling moth and cabbage moth, while a warm, humid season suits the fruit fly. Excessively hot weather, such as that experienced in January, 1939, caused an immediate and considerable reduction in the numbers of many pests, amongst which were the fruit fly, red scale, and many species of aphids.

Excessive rains also may cause a reduction in the numbers of many pests, particularly if the rainy period extends over several weeks. Specific examples are the killing of black beetle grubs in the soil, the destruction of young codling moth larvae, even when inside the fruit, and the flushing out of mosquito breeding pools or swamps. Such conditions may also favour the development of parasitic fungi and bacteria, which may destroy a wide range of pests, from caterpillars to grasshoppers. The unfavourable conditions just suggested are often the means of bringing an insect plague to an abrupt end, but it is of interest to note that cutworm plagues often follow flood periods.

Information of this type is also valuable in helping to make an estimation of the potential damage of a specific insect pest, in various localities, where it may either persist from year to year, or be of occasional occurrence only. Thus, the lucerne flea is not a serious pest in this State. It is confined to localised areas, where conditions are known to be favourable. The Queensland fruit fly, which thrives in our coastal regions, cannot exist from year to year in many of our inland fruit-growing districts, the cause being mainly climatic. Further, the Queensland fruit fly is not yet established in Australian States other than Queensland and New South Wales, and this appears to be due to climatic conditions also.

An unexplained fruit fly mystery is the apparent disappearance of the Mediterranean fruit fly from this State during the course of the last twenty years. Observations have tended to show that it cannot withstand competition with the Queensland fruit fly.

The Locust Information Service in Operation.

Growers, naturally, are interested in making practical use of this kind of information, and particularly in the possibility of forecasting plagues of insects. The most important insect forecast required is probably that concerning the grasshoppers, more correctly named Australian plague locusts. Details of food requirements and climatic factors favourable to the development of swarms have already been closely studied in New South Wales, and, in addition, a Locust Information Service is in operation. Reports are submitted monthly by Stock Inspectors from the various Pastures Protection Boards, and the occurrence, or absence, of a locust outbreak in any particular year may be forecast.

This, however, may be upset by changed conditions. It has been demonstrated that swarm formation originates in definite outbreak areas of well-defined climatic, soil, and pasture characteristics. In the most important Australian outbreak area, the Bogan-Macquarie, an area of some 10,000 square miles, swarm formation has been correlated with a rainfall of 8 inches or more, during the period October to February, when locusts are normally active. Such rainfall also means an unusually good season, and the serious locust plagues of 1937-38 and 1946-47 occurred in years of near record, and record, wheat harvests. An incipient outbreak can be brought to an end by several successive, unfavourably dry months, and this actually occurred on a number of occasions during the war years, and particularly in 1945-46, when extensive hatchings were destroyed by the prevailing droughty conditions.

However, the monthly locust reports furnished by Stock Inspectors throughout the infestation area, and the inspection of egg-beds prior to the spring hatching, give an indication of possible locust activity during the ensuing few months, and are therefore valuable aids to forecasting locust outbreaks.

Reasonable Accuracy is Possible.

In summing up the possibility of forecasting insect plagues, it may be stated that long experience and observations have made it possible to forecast unusual outbreaks of insect pests with some reasonable degree of accuracy. More accurate forecasts could, however, be obtained if large numbers of entomologists, meteorologists, ecologists and soil chemists could give their undivided attention to such a project.

The European Earwig
(*Forficula auricularia.*)

THIS pest was first recorded on the Australian mainland in 1934, at which time large numbers were found causing serious damage to garden plants at Bombala and Delegate in New South Wales; however, its presence had been noted in those districts some four or more years previously. In some seasons it causes considerable damage in the Katoomba and Blackheath districts on the Blue Mountains of this State. It has also been recorded from Adaminaby, Cooma, Jerilderie, Lithgow and Glen Innes.

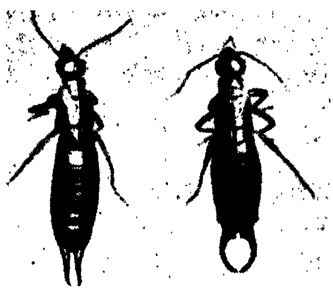
It occurs in New Zealand and Tasmania and for many years has been listed as a pest in Europe and America. It appears to prefer cool districts, and its survival and abundance are largely dependent upon rainfall and temperature.

The life-history has not been studied here, but in Tasmania, Evans[1] records one complete generation a year, although each female lays two batches of eggs, the first in the spring and the second early in summer. The eggs are deposited in small nests or cells beneath the soil and hatch in from two to three weeks. The females remain with their eggs and guard them until they hatch, and may even stay for some time with the small developing earwigs in the nest.

The young grow by a series of moults until they reach the adult winged stage. Evans records six moults as occurring in

Tasmania before they become adult, but in America[8] only four moults are recorded.

The adult, which measures about ½ inch in length, is of a general brown colour. On the upper surface of both the second and third abdominal segments is a pair of pores from which the insect is able to eject an offensive liquid to a distance of 3 or 4 inches. The adult earwigs have well-developed wings, but are seldom seen in flight. Their main method of dispersion appears to be by crawling, but on account



The European Earwig.
(About twice natural size.)

of their habit of hiding in crevices and beneath the soil they may readily be transported with nursery stocks, ornamental plants and bulbs, etc.

Both the young and adults are nocturnal in habit, and are omnivorous feeders. They attack many kinds of plants, including vegetable and ornamental flowers, and may even climb trees and injure growing fruit. They may also feed on seedling plants, and roots of plants, mosses, lichens, fallen fruit and both dead and living insects. The petals of flowers such as dahlias, chrysanthemums, zinnias, etc., are often destroyed.

Houses in close proximity to infested areas may be entered, and foodstuffs, such as flour, starch, sugar, fat, meat, etc., may be eaten.

Control.

Earwigs may be controlled by the use of poison bran baits. A bait recommended in America[3] consists of:—

Wheat bran	.. ..	12 lb.
Sodium fluosilicate (silico-fluoride)	.. ..	1 lb.
Fish oil	.. .. ..	1 quart.

To prepare the bait, the bran and poison are first mixed thoroughly together, and then the fish oil is added and the bait again mixed thoroughly.

The poison bait should be scattered thinly over all the infested area, particular attention being given to distributing the bait along fences, about trees or other places where the earwigs are known to congregate in numbers.

The above quantity of bait is sufficient for one application to an area of from 5,000 to 8,000 square feet. Although the bait rarely causes any damage to lawns, it should not be applied to ornamental plants. Lawns should not be sprinkled with water until the bait has been out for two nights. In gardens and areas of vegetable crops known to be heavily infested, a second application of bait about two weeks after the first is advisable.

Sodium fluosilicate is poisonous and fowls should be kept away from baited areas.

Sodium fluoride in the same proportion may be used instead of the sodium fluosilicate, but this chemical is not quite effective.

A Suggested Alternative Bait.

A suggested alternative bait is the BHC or benzene hexachloride-bran bait used for the control of grasshoppers. This bait has been used by a number of Cooma growers

The European Earwig.
Females, eggs in nest, and newly-hatched young.
[*After Essig.*

against earwigs, with good effect provided twice the normal amount of BHC is used. The fish oil recommended for the standard bait is apparently not essential in the benzene hexachloride bait, and it may be possible that the characteristic musty odour of the benzene hexachloride is in itself attractive to the earwigs.

This bait is prepared by mixing thoroughly 5 oz. of a 20 per cent. benzene hexachloride dust in 12 lb. of bran. When the bait is to be used, 1¼ gallons of water are added to make a crumbly mash which can be readily distributed. The dry benzene hexachloride-bran may be stored, but once the bait is moistened it should be used without undue delay, otherwise heating and spoiling will occur.

Other Methods of Control.

In addition to baiting, the numbers of earwigs may be greatly reduced by the use of traps. An effective trap consists of a flower-pot filled with straw or crumpled paper, inverted on the ground near the plants being damaged. The traps should be examined frequently, and any earwigs sheltering within destroyed by shaking the traps over a tin containing a small quantity of kerosene.

Various parasites have been recorded abroad attacking these earwigs, and these include tachinid fly parasites, worms and parasitic fungi. They are also fed upon by carnivorous ground beetles, toads, snakes and birds.

References.

[1] EVANS, J. W. Insect Pests. Dept. Agr., Tasmania. 95-97. 1943.

[2] CRUMB, S. E., EIDE, P.M., BONN, A. E. Tech. Bull. 766, U.S. Dept. Agr., 1941.

Germination of Liverseed Grass.

FOR some time the germination of Liverseed grass (*Urochloa panicoides*) has been the subject of investigation, and results from the experimental tests indicate that:—

1. The seed must be mature before it will germinate well.

2. Maturity is not reached until about a year after harvest.

3. Mature seed will germinate well (in Sydney) whatever the season.

The seed with which the tests have been made was harvested by Mr. O. E. Uebergang, Crooble Pastoral Company, Crooble, in March, 1947, and had been graded in July. The sample contained about 95 per cent. of grain, but germination remained comparatively low even up to the time the seed was nine months old. Germination at that time, January, 1948, was 55 per cent.

By the time the seed was fourteen months old, however, germination had almost reached the possible maximum and these results were maintained through the four seasons of 1948.

Details of soil tests made in pots in a cold frame with this sample gave the following results:—

Sown.	Germination percentage (in 28 days).
Late autumn (May)	85
Midwinter (July)	84
Spring (September)	90
Summer (January, 1949)	91

Germination in the January tests was much quicker than in any of the previous trials, due probably to the warmer temperatures, rather than to increase in maturity.

Further investigational work both in laboratory and the field will be conducted this year. —AMY MYERS and DOROTHY BEIT, Seeds Officers.

Hormone Spraying of Tomatoes.

IN August, 1947, a trial was carried out with hormones to promote fruit set in glasshouse tomatoes at Warriewood. Using a hand atomiser the fruit-setting hormone B-naphthoxyacetic acid was sprayed on to the blossom and fruit clusters at a concentration of fifty parts per million.

The hormone treatments caused the fruit to set three weeks in advance of the normal fruit in any other glasshouse on the property. The size of the fruit was quite satisfactory, but the tomatoes were elongated or pear-shaped rather than flattish and had the drawback of a certain amount of puffiness.

The sprayed plots produced more fruit than the controls in the period 4th to 7th September (particularly in the second week); whereas the controls gave a higher production than the sprayed groups in the period 16th to 29th October, bringing the total production to the end of October to about the same figure in both the treated and untreated plots.

Another trial, on a smaller scale, was conducted on the same property during 1948. Two applications were made, one on 24th June, and the other on 22nd July, when the weather was much colder. The results were slightly more promising than those of the previous year. The hormone ensured a good setting, but the shape of the fruit was affected. The fruit was of good quality, though seedless, and the abnormal shape was not objectionable except that it would probably realise a slightly lower price than normal fruit.

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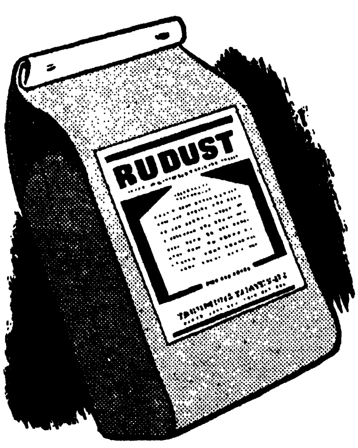

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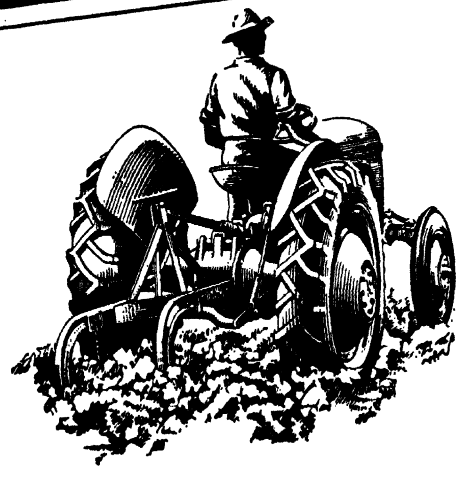

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THE FERGUSON SYSTEM

APIARY NOTES.

The Prevention of—

LOSSES OF BEES IN TRANSIT.

A Problem for Migratory Beekeepers.

D. L. MORISON, B.V.Sc., Apiary Branch.

THOUGH migratory (or itinerant) beekeeping has been practised since ancient times in some countries, it has only become a main feature of the honey industry in New South Wales during the last ten years or so.

Migratory work is desirable in some districts of Australia because the main eucalypt species for honey production occur in separate areas, and since their blooming periods occur at different times of the year, it is possible to work them in rotation.

The migratory method is probably now practised here to a greater extent than in other beekeeping countries. It is the purpose of this article to discuss some of the important points to be considered when moving large apiaries and the pitfalls which one may encounter when doing so.

While it is usual these days to move bees by motor truck, since this method is faster and more convenient, at times bees have been removed by train, boat, etc. Air transport of bees is usually restricted to queens and escorts, or perhaps nucleus colonies.

The Truck Must Be Suitable.

There are three main requirements in a truck to be used for migratory work:—

1. It must be reliable—to avoid delays and increased possibility of loss of bees in transit.

2. The truck table should be fairly low—to reduce lifting to a minimum.

3. The truck table should be of such a size as to take a certain number of hives without wastage of space.

Temperature Regulation in the Colony.

It is desirable that some aspects of the physiology of the normal colony of bees be considered if the main causes of death in transit are to be understood and losses more rationally avoided.

It is intended to discuss temperature regulation in the colony in some detail, since under New South Wales conditions at least, it is contended, the main source of damage to bees during transit is due, in one way or another, to excessive heating in the load of bees.

In summer the hive temperature is maintained by the bees in the vicinity of 95 deg. Fahr. If the temperature rises above this point, the bees cool the hive by evaporation of moisture. Water may be carried into

A Hive Strapped for Transport.
Cover reversed to provide ventilation.

the hive and deposited in cells. A current of air is kept circulating—in one side of the hive entrance, between the combs, and out the other side of the entrance. This air, unless totally saturated, will evaporate moisture and thereby cool the hive.

If the bees are numerically strong and have difficulty in keeping the temperature down, they will cluster thickly at the entrance, an action known as "hanging out."

Of course, if external temperatures are low, considerable heat is lost by conduction and convection, and the bees may be compelled to conserve heat by clustering, rather than attempting to bring about heat loss.

The following are the main ways in which a hive may gain heat, resulting in rise in colony temperature—

1. By radiation, *i.e.*, by the direct heating effect of the sun's rays.

2. By conduction and convection—should the day be very hot and the atmospheric temperature above colony temperature.

3. By metabolic heat given off by the bees—the result of oxidation processes essential to the maintenance of life.

The amount (number of calories) of heat given off by a colony will depend upon:—

(*a*) The number of bees in the colony, *i.e.*, colony strength; also the quantity of brood present.

(*b*) The degree of activity of the bees.

This last point is most important. In one series of experiments it was shown that when the bee was at rest at 18 deg. C. (64.4 deg. Fahr.), the oxygen consumption was 30 cmm. per gram per minute. During flight the oxygen uptake rose to 1,450 cmm. per gram per minute, a 48-fold increase.

Since heat production is proportional to oxygen consumption it will be seen that a great increase in the activity of bees in the colony will not only result in tremendous heat production but also in oxygen consumption.

Influence of Temperature Increase.

Moreover, as colony temperature rises the bees are capable of greater activity, since their potential degree of activity depends upon the temperature of their immediate environment. When the temperature approximates the optimum for the bees' activity, heat generation may be very great if some exciting factor—such as light falling on a transport screen on the hive—is operating or if a high temperature already exists, causing the bees to mill and rush about the screens (if such are used)—with the result that there is further heat increase, and a vicious circle is created. Under these conditions the thermal death point of the bees is very quickly reached.

When transporting a load of bees the damage is often done in the last hour or so before bees are unloaded; if the bees

were "roaring" and emitting a characteristic smell similar to hot honey or new bread it indicates that the bees are overheating and may be damaged.

When a large number of hives containing colonies of bees are placed together (as on a truck for transport) the problem of dissipation of heat from the hives is further complicated, for the temperature gradient from the middle of the load to the outside of the load does not permit of very rapid loss of heat—owing to the large mass involved.

of minor importance compared with losses from overheating.

It has been claimed by Mr. C. B. Scarfe, of South Australia, and a Russian research worker, that bees do not require special ventilation during transit—and this is true providing the temperature can be kept down. However, beekeepers are not advised to try any no-ventilation system, unless perhaps on a small scale for a commencement.

The cage in which a consignment of Caucasian bees was forwarded to this

Hives Stacked on a Lorry for Transport.

Short lengths of plain galvanised iron curved to a semicircle are inserted between the covers and the hive bodies in the outside rows to act as deflectors to increase air circulation among the hives.

Department from Russia did not appear to have any provision for ventilation, and all bees were dead on arrival. This consignment was about ten days in transit and had to pass through tropics where the temperature would be high and rather different to any which would be encountered in the U.S.S.R. It was not possible to determine how the bees died—whether from overheating, lack of oxygen or some other cause—but, considering the route taken, it is thought that high temperature was primarily responsible.

Causes of Bee Losses in Transit.

The causes of losses of bees during transit are as follow:—

1. Overheating, perhaps associated with lack of oxygen; 2. breakdown in comb; 3. new honey shaking out of the combs; 4. loose frames; 5. motor accidents; 6. leaking bees.

These causes are considered below in greater detail and preventive measures suggested.

1. *Overheating, perhaps associated with lack of oxygen.*—Though it does not appear that any exact experimental work has been done on this subject, it would appear safe to assume, in view of what has already been stated in this article, that overheating is the main cause of damage in bees transported in New South Wales. It is uncertain whether losses are due to lack of oxygen or not; however if losses do occur from this cause they would appear to be

Measures to be taken to prevent overheating in a load of bees are:—

(*a*) Inspect the route to be taken and arrange for a site in advance so that there will be no unnecessary delays.

(*b*) Load the bees in the evening and move them at night when it is cool. Shifting at night also prevents the bees becoming excited, due to light gaining access to

screens (if these are being used), since during daylight the attempts of the imprisoned bees to escape through any lighted aperture may result in considerable activity.

(*c*) Do not delay once the destination has been reached; unload promptly. If it is necessary to park for a time leave the loaded truck in the shade.

(*d*) Unless conditions are very humid it is a good plan to splash water over the hives before loading and at intervals during transit.

(*e*) Arrange the load so that there is some circulation of air between hives.

A case is on record of a beekeeper using large quantities of ice to keep his bees cool on a long rail journey. Of course, if the weather is cool, it may not be necessary to take any special precautions. However, under heat-wave conditions and especially if the bees are strong, precautions should be taken or the move deferred for a time, if it is not urgent.

Considerable attention has been given to different methods of ventilation; however, the temperature of the load of bees is more important than the method of ventilation.

2. *Breakdown in Comb.*—This often occurs when the bees become overheated, new comb being more easily melted down. The weight of a large amount of brood and honey also tends to make the combs break down. It is, therefore, best to extract honey prior to moving the hives and to remove any new comb if it is anticipated that the bees will heat up. Serious melting down of combs is probably the worst thing that can happen in a load of bees, since it results in the death of the bees, the loss of combs and a big mess to clean up.

3. *New Honey Shaking Out.*—When bees which have been working a dilute flow are transported, the honey from the combs may shake out on to the bees and kill quite a number. In such a case it may be best to defer the move and extract if the flow is heavy, or close the bees at night and then shift towards morning, by which time the bees may have partly ripened the watery nectar.

4. *Loose Frames.*—This results in the frames shaking about and crushing bees. It may be avoided by placing the full number of combs in each box prior to shifting, and perhaps pushing them across and nailing them in position if there is any "play" in them. Frame spacers have also been used.

5. *Motor Accidents.*—At times it is necessary to drive fairly fast in order to promote air circulation in the load and to get the bees on to the site without undue loss of time. However, it is as well to remember that loads of bees have been turned over and the result can be imagined. At times trucks have been bogged and it has been necessary to unload the bees at the side of the road. On one such occasion travelling stock were stung.

6. *Bees Escaping.*—Bees which escape from faults in the hives when in transit not only represent a loss to the apiarist but can cause a serious public nuisance, especially if the load is parked in the town for a time.

Risks are Not Always Realised.

It is not the purpose of this article to encourage haphazard migratory work, but rather to render the moving of bees a more economic procedure by eliminating avoidable losses—particularly those likely to be made by men who are unaware of risks which may be encountered under certain circumstances.

Control of Cutworms by Newer Insecticides.

THE continued presence of cutworms in crops in the Shellharbour district has given officers of the Department's Entomological Branch an opportunity to conduct many tests with some of the newer insecticides.

A benzene hexachloride (BHC) bait similar in composition to that used against grasshoppers was found very effective for cutworms where the ground was free of weed growth. As the climbing cutworm was present it was necessary to dislodge the cutworms by brushing against the standing crop.

Excellent control was also given by a 0.2 per cent. DDT spray, or by a 5 per cent. DDT dust. These treatments were found very effective in spite of having been applied during the recent wet weather. In some sections in which the DDT spraying or dusting produced results, a very heavy weed growth was present.

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COMMON INTERNAL PARASITES OF HORSES

May Cause Ill-health.

Their Recognition and Treatment.

VERY few horses are entirely free from infestation with one or more of the numerous species of worms or internal parasites that may infest them. Infestation of sufficient degree to cause ill-health in horses is not common under ideal conditions, but, on the other hand, horses kept under adverse conditions may frequently be affected. In general, horses carrying an excessive number of internal parasites are subject to digestive disturbances and loss of condition, and are unable to perform the usual amount of work.

The true cause of such ill-effects is not always the apparent one. As will be seen later, infestations with bot-fly larvae are easily recognised, but in the main, the trouble caused by these parasites is far less serious than that caused by redworms, which may be present with the bots, and not be recognised. It will be appreciated, therefore, that a correct diagnosis is always an essential before embarking on treatment.

WHAT ARE THE COMMON PARASITES?

There are numerous different species of internal parasites, but these species may, for the purposes of this article, be grouped together. These groups are roundworms, redworms or bloodworms, stomach worms, tapeworms, pinworms and bots. Of these, it will be seen later that the first three types are of most importance.

It is pointed out at this stage that, with very few exceptions the internal parasites which infest other species of livestock do not infest horses. This is a matter of great importance in control, as the pastures may be spelled from horses, and at the same time utilised for the other species of livestock.

Roundworms.

The Roundworm (*Ascaris equorum*) is one of the most common internal parasites of the horse. The worms which are from 6 to 12 inches in length, may be frequently seen in the droppings of an infested horse. Although adult horses may carry large numbers of these parasites without showing any

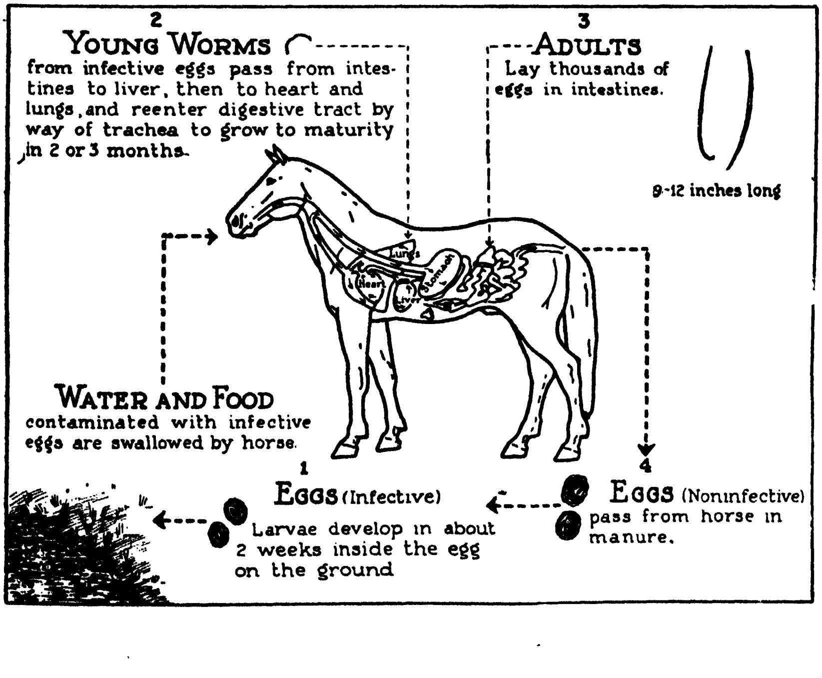

Fig. 1.—Life History of Large Round Worms.
[*After Thorp and Graham.*

signs of the infestation, they may cause serious ill-effects in foals.

The life-cycle of this parasite is illustrated fully in Fig. 1.

The mature worm is normally found in the small intestine, but at times it may be seen in other portions of the intestinal tract. The worms cause irritation to the lining of the bowel, and this leads to alternate scouring and constipation. In foals, a long standing infestation may lead to a pot-bellied condition. In addition to the irritation caused by the worms, they secrete a toxin or poison which is absorbed into the bloodstream. This toxin has the effect of reducing the animal's resistance, and may ultimately lead to death.

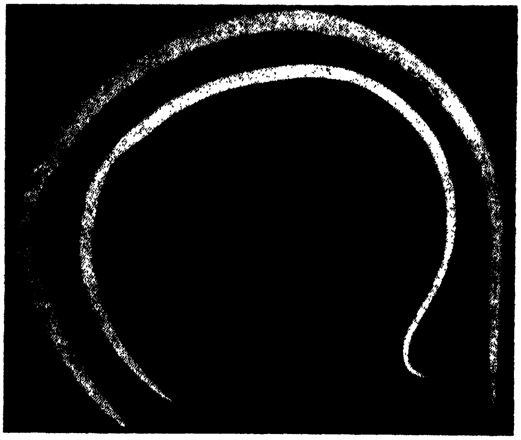

Fig. 2.—The Round Worm.
(Two-thirds natural size.)
[*Illinois College of Agriculture Circular* 496.

Red Worms.

The term red worm is used to describe a number of different worms found in the large intestine and bearing the generic name of *Strongylus*. They are similar in their effects, and for that reason, they are not described individually. As a group, they are the commonest and most serious worms of horses in this State. They vary in length from ½-inch to 2-inches, and are comparatively thick. Normally, they are white in colour, but after sucking blood they become red—hence the name commonly given to them.

The life-cycle, illustrated in Fig. 3, is very different from that of the large roundworm.

Due to the amount of blood they remove, these parasites cause anaemia, loss of condition, unthriftiness and general weakness. As a result of the interference with the bowel wall, there may be considerable inflammation of the intestines, leading to constipation and diarrhoea at different times, and the droppings are covered with a slimy mucous. The loss of appetite which frequently occurs further accentuates the loss of condition.

As will be seen in Fig. 3, in one species, namely *Strongylus vulgaris*, the larvae on hatching congregate at the root of the main arteries supplying blood to the large bowel. As a result of the damage done by them, the artery walls become weakened, and at times these rupture, leading to the sudden death of the animal. At other times, the blood flow may be partially blocked leading to attacks of violent colic.

Another serious, though uncommon, effect, is rupture of the bowel as a result of its walls being weakened by the attacks of the worms.

Stomach Worms.

There are two main types of stomach worm. The Small Stomach Worm (*Trichostrongylus* spp.) is about ¼-inch to ½-inch in length, and hair-like, so that it can be seen only in good light when it is carefully sought. It is not generally regarded as being of any great importance in this State. The Large Stomach Worm (*Habronema* spp.) is about ½ to 1 inch in length, white in colour and quite slender. Its life-cycle, illustrated in Fig. 4, is again quite different to those of the species already described.

When the larvae are swallowed they become attached to the stomach wall, and penetrate its tissues. Bacteria subsequently enter the paths of the larvae and set up a chronic infection, followed by the formation of tumour-like masses on the walls. Digestion naturally is considerably impaired, while sharp attacks of colic may be seen. Infrequently, the stomach wall ruptures, followed by the rapid death of the animal.

Tapeworms.

Tapeworms (*Anoplocephala magna* and *A. perfoliata*) are not of much importance in the horse, though at times, partial blockages of the bowel may occur, leading to symptoms of colic and unthriftiness. The

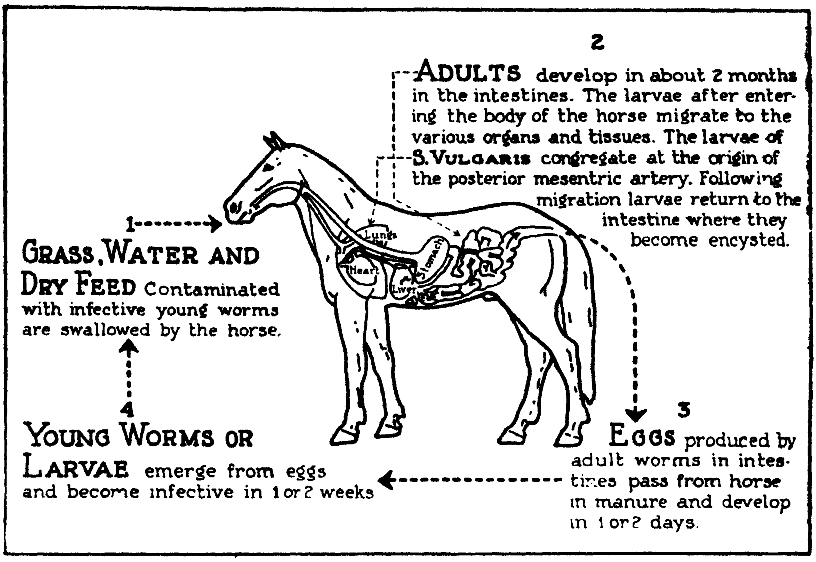

Fig. 3.—Life History of Red Worms.

worms themselves may be a foot or more in length and up to ½-inch in width, being flat and ribbon-like, and divided clearly into numerous segments. As the worms mature, segments containing eggs are shed, and these are frequently seen in the droppings.

The life-cycle of these worms has never been worked out in detail, hence control measures, when necessary, can only take the form of treating the animal to remove the worms. Some idea of the size and appearance of these worms may be obtained from a study of Fig. 5.

Bots.

Bots, or "bot-worms" as they are sometimes known, are actually the larvae of the bot-fly (*Gastrophilus* spp.). There are several species of this fly, but for all practical purposes their effects are the same, and similar control measures are taken against them.

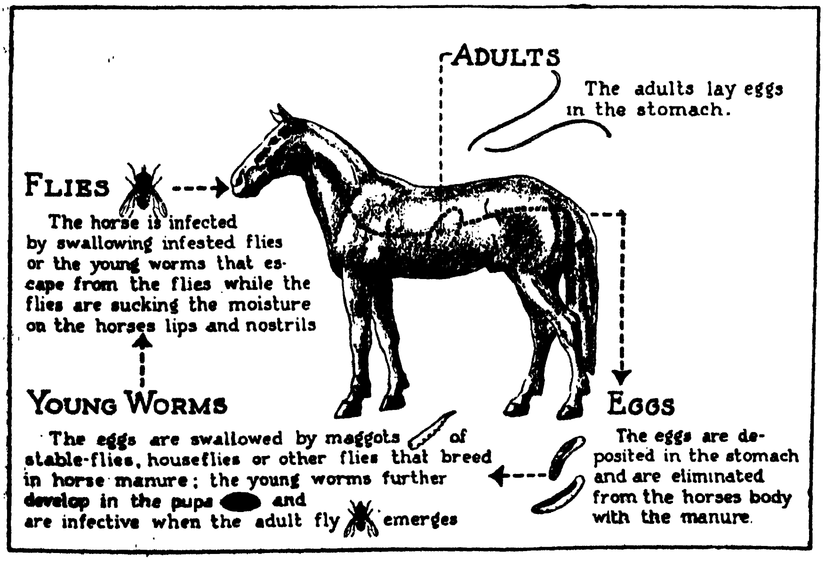

Fig. 4.—Life History of Large Stomach Worms.
[*After Thorp and Graham.*

The life-cycle of the parasite, and illustrations of the flies and larvae are given in Fig. 6, which sets out clearly the various phases of development.

Although bots may be the cause of serious ill-effects, the fact remains that horses may carry considerable numbers of bots with little or no adverse effects. The bots

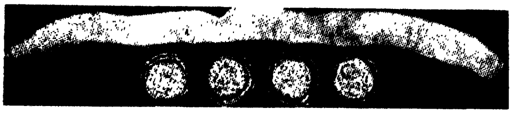

Fig. 5.—Tapeworm of Horse and Eggs.
These parasites are found in the small intestine. Heavy infestations cause intestinal catarrh, indigestion, and unthriftiness and, in severe cases, anaemia and emaciation. The eggs, shown in the lower part of the picture (greatly enlarged) are found in the ripe posterior body segments of the adult worm. These ripe segments break away and pass out in the manure. (The mature worm is shown 2/5 natural size.)

[*After Thorp and Graham.*

attach to the wall of the stomach and produce irritation which may lead to attacks of colic. Digestion may be impaired to an extent depending on the degree of infestation. In heavy infestations, there is a general loss of condition, weakness and susceptibility to attacks of colic.

Pinworms (*Oxyuris equi*).

These worms are not of any great importance, but a consideration of them is included to complete the list of the principal parasites of horses. The female worms are very long and slender, measuring up to 6 inches in length. The males, on the other hand, are very small and are not often seen.

The female, which is found in the large bowel, deposits her eggs around the anus. This process leads to considerable irritation which causes the horse to rub its hindquarters vigorously and remove the hair from its tail. This normally is the only adverse effect of the worm. Very rarely, heavy infestations may lead to loss of condition and general weakness.

Diagnosis of Internal Parasitism.

It will be readily realised from what has been written that the symptoms of infestations with the various species are not clear cut, and thus a diagnosis cannot readily be made on this score alone. Incorrect conclusions may be drawn from visible signs of infestations. For example, although bot larvae may be seen in the faeces of a horse in poor condition, it is quite possible that, say, redworms may be the main cause of the condition.

In a later section, it will be shown that the treatment for the different parasites varies, so that it is of importance that the diagnosis be correct. The only way in which such a diagnosis may be made with certainty, is to have a sample of the droppings examined at a laboratory. Such a sample must be forwarded without preservative, and with a minimum amount of delay; a tobacco tinful is sufficient. The Veterinary Research Station at Glenfield is willing to undertake such examinations in the case of farm horses.

It is pointed out that faecal examination, while of great value in determining the presence of the principal parasites, is of little value so far as bots are concerned. But if

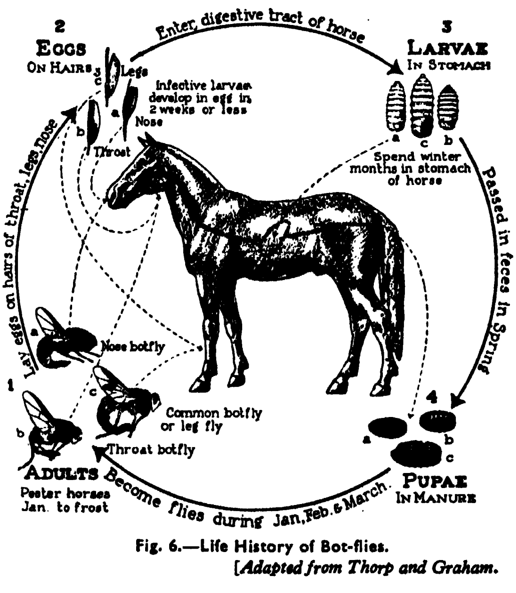

Fig. 6.—Life History of Bot-flies.

[*Adapted from Thorp and Graham.*

no other parasites are detected, and bots are being passed in the droppings in large numbers, they may be provisionally regarded as being responsible for any unthriftiness shown, and treatment should be carried out. As pointed out earlier, however, bots are not often the sole cause of such a condition.

(*To be concluded.*)

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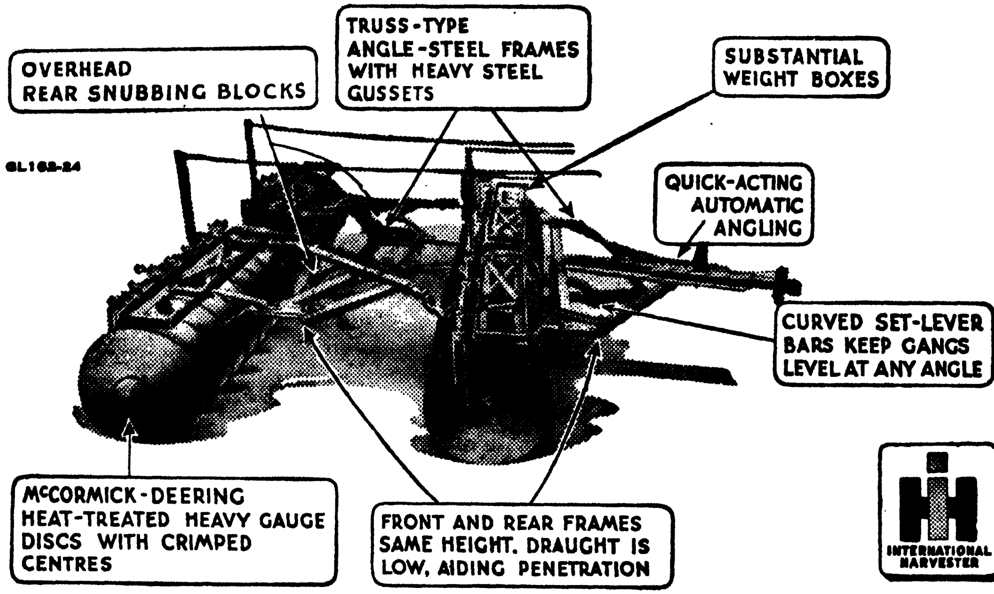

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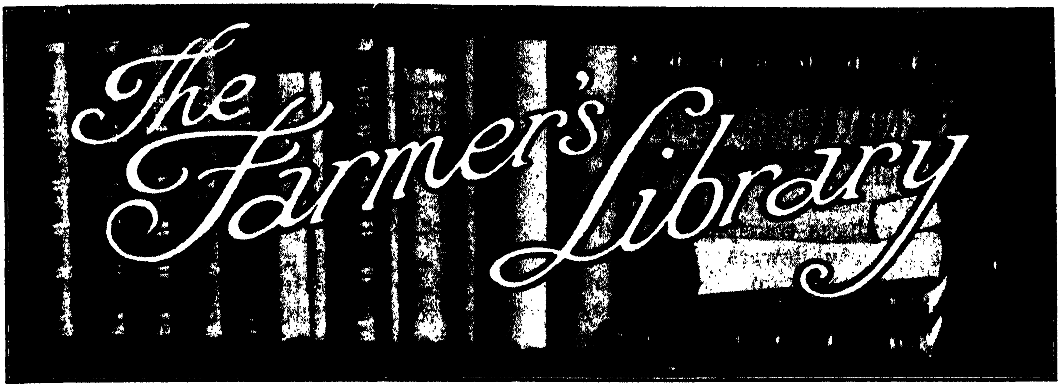

Reviews of Books of Interest to Farmer and Student.

"Proceedings of the Sixth International Conference of Agricultural Economists."

AT the Sixth International Conference of Agricultural Economists held at Darlington Hall, England, in August and September, 1947, nineteen addresses by agricultural economists from various countries were given, covering a very wide range of subjects. This volume contains the text of these addresses and the subsequent discussions.

There are some essays—perhaps of little direct interest to the Australian producer—which deal with the development of agriculture in other parts of the world. But even if our problems are vastly different, some of the essays, especially those on Indian agriculture by Sir Manilal Nanavati and on British West Indies agriculture by C. Y. Shephard, are of great intrinsic interest because they provide the reader with a very clear picture of the tremendous difficulties which face backward areas with large peasant populations in their task of improving the efficiency of their agriculture. The descriptions of recent changes in United States and British agriculture by S. E. Johnson and J. A. Scott-Watson respectively, are useful summaries, but do not break any new ground.

The relative merits of state trading and free enterprise in the purchase and sale of primary products was a widely debated subject at the conference. The American economists at the conference were mostly lined up on the free market side, whilst British, New Zealand and other non-American members of the conference seemed to favour some checks on the free market system. This is, of course, an over simplification; but generally speaking, the United States economists stressed the dangers of state control, *e.g.*, the rigidity, growth of bureaucracy and lack of incentives, whilst on the other side, the disadvantages of the market mechanism such as the violent price fluctuations, the greater bargaining power of the merchant or processor vis-a-vis the farmer, and the disastrous experience of the 'thirties, were given more prominence by economists from other States.

Two articles of direct interest to farmers deal with "Work Simplification in Agriculture" (by L. S. Hardin) and "Scientific Management in Agriculture" (S. Schmidt). Scientific management and work simplification in agriculture have not received much prominence in this country in the past. Interest in this subject is growing both in United States of America and Europe, and judging from some of the remarkable results which are claimed for these techniques, more attention should be devoted to these studies in Australia.

Whilst this book has considerable interest for those who deal with the economic aspects of agriculture, farmers generally are likely to find it too theoretical and too technical for their own use.

Our copy from Jeffrey Cumberlege, Oxford University Press, 1948.

Review by C. J. King.

. . . SAVE FOR BETTER DAYS . . .

Cauliflower Growing—*continued from page 176.*

made returnable, as are lettuce crates. The saving in freight would be enormous, as evidenced by the tons of discarded leaves and stumps left on American farms, and a good deal of time is saved in the transportation of crated cauliflowers. The trimming of the heads reduces transpiration and ensures that the cauliflowers arrive at the market in better condition. Another aspect which is of some importance in Sydney is that the crates would be of some value in counteracting petty thieving.

In recent years some growers have adopted the practice of individually wrapping high-quality heads in cellophane. Lining the crates with paper would assist in protecting the curds.

Cauliflower Defects.

The chief defects noted in cauliflowers in the Sydney market are usually due to physiological causes.

The open texture of the curd, which is sometimes known as "broken" curd, is invariably the result of cutting too late. A soft-textured curd results either from cutting too early, or from high temperatures during the last few days prior to cutting.

Curds which are exposed to the sunlight often develop a yellowish or brown colour. This is considered a very bad defect in local markets. The top of the curd sometimes becomes "ricey" in appearance, the condition usually being associated with over-maturity and warm, dry weather. "Riciness" is not considered to be a bad defect on the market.

Some varieties are very subject to a defect known as "fuzziness," since it shows up in the form of a "fuzzy" appearance on the surface of the curd. This is also due to warm conditions. Small, green leaves growing up between the segments of the curd, are indicative of a form of deterioration, and if occurring in large percentages throughout the crop, would definitely point to poor quality seed.

Seed Production.

A common procedure in the raising of cauliflower seed is to concentrate on a few rows along the side of the field. Plants with unsuitable curds should be destroyed, otherwise they may flower and cross-pollinate, rendering the seed crop useless. As cauliflowers are cross-pollinated by insects, it is advisable to have the seed plot at least half a mile from other cauliflowers or allied crops like cabbage that may be flowering at the same time, or arrange planting so as to have varieties or crops of the same family flowering at different times.

Another method is to select plants and transplant them to a convenient position, but this is only successful under ideal conditions. Select for uniformity with regard to quality, type, maturity, and disease resistance. Make the selection when the curds are at the right stage to cut; select plants providing good leaf cover for the curd. The curd should be white, compact, free from blemish and well developed underneath towards the base of the leaf. Avoid plants showing "riciness," "fuzziness," leaves growing up through the curd, or those in which the curd is spreading.

Harvesting.

The seed should be harvested when fully formed, but before the pods commence to open. The stalks carrying the seed pods may be spread out in a dry, airy shed, and when cured the seed can be threshed out by flailing on a tarpaulin or tent fly, or putting through a suitable machine.

Diseases.

The most important diseases of cauliflower are black rot, whiptail, club root, sclerotinia rot, downy mildew, damping-off and wirestem.

Black rot is a seed-borne disease and, if there is any possibility that the seed is carrying this disease, it should be treated for eighteen minutes in hot water at 122 deg. Fahr. In order to prevent the seedlings becoming affected with diseases carried over in the seed-bed soil, the seed-bed should be located on new soil, sterilised soil (*see* Plant Disease Leaflet No. 103, obtainable from the Department), or soil which has not grown cauliflowers, cabbages, turnips, etc., for several years.

In whiptail-liable areas it is recommended that the seedlings in the seed-bed be watered one to two weeks before transplanting with a solution of crude (43 per cent.) sodium molybdate or of pure ammonium molybdate, at the rate of 3 oz. of the former material or 1 oz. of the latter in 10 gallons of water to each 10 square yards of seed-bed.

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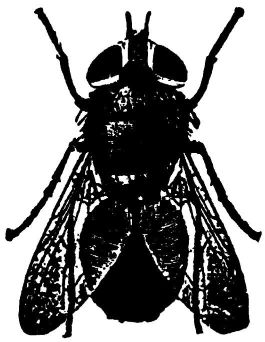

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17/- per gallon—in 4-gallon drums.

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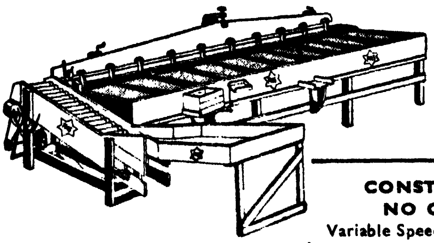

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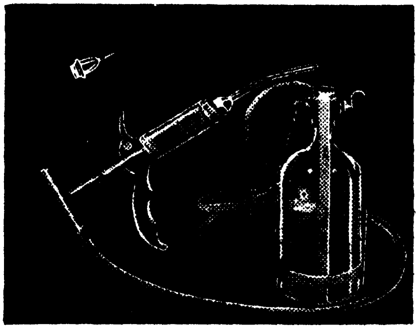

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If the season is wet it is advisable to spray the seedlings once a week, from the time they are an inch high until they are transplanted with Bordeaux mixture (1-1-10 formula) to control downy mildew, damping-off and wirestem. Nicotine sulphate and DDT may be added to the Bordeaux mixture to control insect pests on the seedlings.

Many of the diseases which affect cauliflowers are able to survive in the soil or on refuse (leaves, stems, roots, etc.) left in the soil from preceding diseased crops and two or three years should be left between crops of plants belonging to the cabbage and cauliflower family. Should land become severely infested with club root or sclerotinia rot it may be advisable to cease growing cauliflowers on the land, particularly in the case of club root. The latter disease, however, may be almost eliminated from land if it is treated with heavy dressings of hydrated lime (2 or 3 tons per acre or more may be needed).

Further information on cauliflower diseases is available in Plant Disease Leaflet No. 87, obtainable from the Department.

Insect Pests.

Brief control measures for the common pests of cauliflower are as follows, but separate leaflets are obtainable from the Department.

Cabbage Moth and White Butterfly.—Dust with 2 per cent. DDT powder or spray with 0.1 per cent. DDT emulsion, *i.e.*, 2 pints of 20 per cent. emulsion to 50 gallons of water.

Aphids.—Spray with HETP 1 fluid oz. to 12½ gallons of water, or spray with 0.1 per cent. DDT emulsion, 2 pints of 20 per cent. emulsion to 50 gallons water. Dusting with 5 per cent. nicotine dust is also effective against aphids.

Cutworms.—Use a poison bran bait consisting of Paris green 1 lb., bran 24 lb., salt 8 oz., water 2½ gallons.

Infectious Laryngo-Tracheitis in Poultry.

Tamworth a Protected Area.

All consignors of poultry and other persons concerned are urgently warned by the Department that the Tamworth Pastures Protection District is a protected area in respect of infectious laryngo-tracheitis in poultry.

Following a survey in 1945, which indicated that the disease was not then present in the area, the district was declared a protected area. A prohibition was placed on the introduction of all poultry, with the exception of day-old chicks and adult stock consigned direct to an approved slaughtering establishment for immediate slaughter. These two classes were permitted entry only if in possession of a certificate issued by a government veterinary officer or an inspector of stock.

The Department has recently received reports of cases in which all classes and ages of fowls have been illegally consigned to farmers within the protected area. In some instances it is suspected that the introductions were responsible for outbreaks of the disease, which caused considerably mortality, but which were fortunately brought under control.

For this reason it is again desired to emphasise that, with the exception of the two classes of poultry mentioned above, the introduction of all poultry to the Tamworth Pastures Protection District is prohibited.

Buck Plum—An Outstanding Stock.

Buck plum stock, introduced for trial by the Department of Agriculture some years ago, has given outstanding results at Bathurst and other areas where main commercial varieties of European plums have been grown on it.

In trials at Bathurst the varieties Angelina, Grand Duke and President on Buck stock have been compared with trees of the same varieties on a selected Myrobolan stock—the standard recommendation for plums grown on the Tablelands.

As a rule all varieties on Buck stock have produced much larger trees than those on Myrobolan stock. The varieties on Buck plum have produced 50 per cent. more fruit than trees on Myrobolan, and fruit size has also been generally better.

POULTRY NOTES

PREPARATIONS FOR THE REARING SEASON.

E. HADLINGTON, Principal Livestock Officer (Poultry).

APRIL is the time of the year when arrangements should be made for the rearing season, especially for procuring early-hatched chickens. To leave the placing of orders until the main season commences frequently results in the poultry farmer having to take late-hatched chickens, which very often prove unsatisfactory both as regards rearing and subsequent egg production.

Those who wish to raise heavy breeds should obtain the chickens between 1st June and 31st August; light breeds should be obtained from 1st August to mid-September, while crossbreds might come in between the two. Pullets hatched at these times have a good chance of missing a moult during the autumn if kept under satisfactory conditions.

If chickens cannot be obtained at the times mentioned and there is a choice of getting them a month earlier or a month later, it would be infinitely better to take the early ones. These may moult in the autumn but they will lay for several months before moulting and only take a few weeks to come back into production, whereas, the birds hatched after the end of September, unless raised under specially good conditions, may not come on to lay before April or May, and then only lay intermittently.

Anyone who is not convinced that late-hatched chickens are mostly unprofitable should look around the farms at this time of the year and see the thousands of unthrifty pullets which have not yet commenced to lay, to say nothing of those already culled.

Does it Pay to Replace all Hens?

The question is often raised as to whether it would pay better to replace all the hens each year with pullets or follow the usual practice of replacing half the hens each year. There are many factors to be taken into consideration before coming to a decision as to which course is best.

In the first place, accommodation is an important matter and no attempt should be made to raise more pullets than can be properly handled through all stages of the equipment. Next comes labour and, if additional assistance has to be employed, the cost may offset any advantage in higher returns. Other items are cost of feeding and market price of eggs and hens.

However, taking into account only the relative costs and returns without allowing for labour or cost of any additional

accommodation, there would, under present conditions, be a substantial gain in favour of replacing all the hens each year.

The comparative figures on a 1,000 layer flock are shown in the following statements:—

Replacing Yearly.

Expenditure—	£	s.	d.
Cost of rearing 1,000 pullets to productive age at 4s. 10⅝d. each ...	269	5	5
Feeding 1,100 layers (less losses, say 10 per cent. = 1,000) for one year at 13s. 9d. each	687	10	0
	£596	15	5
Income—			
Sale of 14,000 dozen eggs at 1s. 11½d. doz. net	1,370	16	8
Sale of 1,000 hens (3½ lb. each) at 1s. 4d. lb.	233	6	8
	£1,604	3	4

	£	s.	d.
Total Income ...	£1,604	3	4
Total Expenditure	956	15	5
Gross Income ...	£647	7	11

Replacing Half Each Year.

Expenditure—	£	s.	d.
Cost of rearing 600 pullets to productive age at 4s. 10⅝d. each ...	146	17	6
Feeding 1,000 layers for year at 13s. 9d. each	687	10	0
	£834	7	6
Income—			
Sale of 12,000 dozen eggs at 1s. 11½d. doz. net	1,175	0	0
Sale of 400 hens (4½ lb. each) at 1s. 4d. lb.	120	0	0
	£1,295	0	0

	£	s.	d.
Total Income ...	£1,295	0	0
Total Expenditure	834	7	6
Gross Income ...	£460	12	6

The basis adopted for arriving at the cost of raising the pullets up to productive age is as follows:—

The purchase price of the chickens is set down at £7 10s. 0d. per 100 and allowance

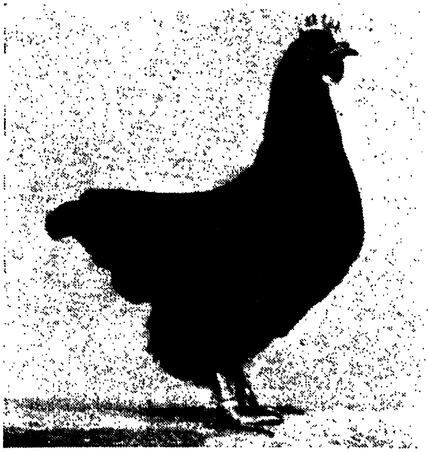
Winners in the 1948-1949 Hawkesbury Agricultural College Egg-Laying Competition.

THE 47th Annual Egg Laying Competition held at Hawkesbury Agricultural College, Richmond, concluded on 16th March.

The Grand Championship (the A. A. Dunnicliffe Prize of £10 10s. for the group laying eggs of greatest market value) and the Golden Egg Trophy (donated by the Metropolitan Meat Industry Commissioner and awarded for quality and production) were won by Messrs. C. A. Clark and Son, whose team of six White Leghorns laid 1,441 eggs, having a market value of £13 2s. 1d. and scored 96.1 points for quality and production.

Mr. P. Bevan was the winner of the Grand Championship Consolation and Golden Egg Consolation prize. The market value of the eggs laid by his team of Australorps was £12 12s. 9d. and the number of points scored for quality and production was 83.

One of the Group of Six White Leghorns which won the Grand Championship and the Golden Egg Trophy for Messrs. C. A. Clark and Son.



An Australorp of the Team entered by Mr. P. Bevan who won the Grand Championship Consolation and Golden Egg Consolation Trophy.

is made for 20 per cent. losses in rearing. Feeding costs to six months are estimated at 2s. 10¼d. per bird and brooding costs at 3d. per bird. This works out at a total of 4s. 10¾d. to raise each pullet.

It will be noted that allowance is made for raising 1,100 pullets in the case of replacement of the whole flock and 600 for replacing half of the flock. This is to provide for mortality during the year and for the same reason cost of feeding for the whole year is shown for 1,000 birds only in both cases.

Production is based on fourteen dozen per bird for the pullets and twelve dozen for half pullets and half hens.

It is difficult to estimate the exact numbers of birds which would be left in a flock at the end of the year, but it is considered that the figures should apply to an average flock. In cases where abnormal mortality occurs the numbers would vary considerably.

To sum up the position, it is apparent that under present conditions it would pay to raise as many pullets as can be properly accommodated without additional equipment or labour, but it should be emphasised that no attempt should be made to raise additional pullets if they have to be overcrowded or neglected through lack of labour. On the other hand, the season should not be unduly prolonged in order to rear more pullets, as this will be detrimental to the later chickens and probably result in excessive losses or unthrifty birds.

THE LEUCOSIS DISEASE COMPLEX OF POULTRY.

D. G. CHRISTIE, B.V.Sc., H.D.A., Veterinary Officer.

THE discovery that several disease manifestations in poultry are due to a common cause, has led to the use of the term "leucosis" to embrace all these conditions previously considered distinct entities. This has performed the service of focussing attention on the intermittent losses from different causes (so-called "normal loss") and of showing that collectively, these, or most of them, form the leucocis disease complex, which is responsible for an average annual mortality of approximately 20 per cent. in New South Wales flocks above chicken age. Thus, leucosis generally causes greater loss in birds above chicken stage than all other disease conditions together.

While the manifestations of leucosis vary considerably, the underlying feature common to all is an upset to the blood-forming cells. This upset takes the form of a cancerous increase in the numbers of various blood-forming cells, and the manifestation of the disease depends partly on the type of blood cell involved, and partly on the effects of other predisposing causes.

Disease Synonyms.

The following list of names given to manifestations of the leucosis complex is not intended to confuse, but rather to serve as a reference, so that any information given in respect of any one of them may be related to leucosis:—

Range paralysis, wasting disease, neurolymphomatosis gallinarum, lymphocytomatosis, lymphomatosis, lymphocytoma, big liver disease, leucaemia, or leukemia, erythroleucosis, myeloid leucosis, iritis, osteopetrosis, erythroblastosis, granuloblastosis, myelocytomatosis, hepato-lymphomatosis, endothelioma, fowl paralysis, haemocytoblastoma, mesoblastoma, sarcomatosis, fowl sarcoma.

The Cause.

Leucosis is an infectious disease caused by a virus—which is smaller than any bacteria and cannot be seen under the ordinary microscope. This causal agent must be present before the disease can occur, and any other predisposing causes, however important, will only tend to modify the manifestation and severity of the disease.

Some workers still contest the issue regarding the cause of the disease, but these are now in the minority. Among the many proposed causes which have now fallen into disfavour, are the following:—Vitamin E deficiency; a group of organisms known as the paratyphoid group; coccidia; and hereditary factors alone.

There is also a conflict regarding whether one virus is involved or several. Some workers have demonstrated that the virus from a bird suffering from one form of

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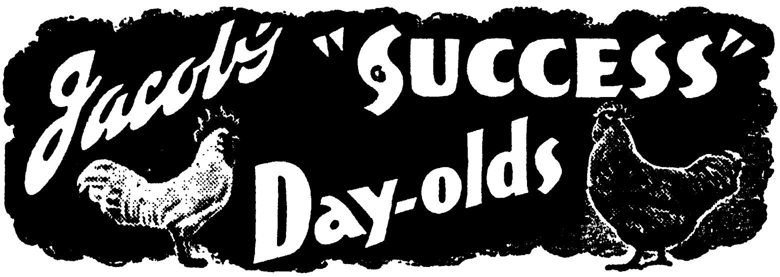

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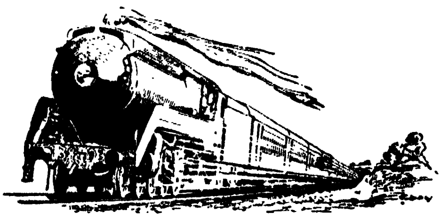

Train Travel Cheaper than 20 Years Ago

We pay so much more for most things these days that we do not expect to be told that train travel in New South Wales is less costly now than it was twenty years ago. Nevertheless it is so.

Let us take a typical journey: a holiday trip to a tourist resort 100 miles from Sydney. In 1929 the first-class return fare was 35/6d. whereas today it is only 25/1d.

The difference between 35/6d. and 25/1d. is considerable, but the difference between 35/6d. in 1929 and 25/1d. in 1949 is still greater; when allowance is made for the depreciation in the value of money we find that the real costs of the return fare were almost twice as much in 1929 as they are in 1949.

The difference is not so great for the single journey. Actually, the first-class single fare for a train trip of 100 miles from Sydney was 17/9d. in 1929, whereas it is now 18/10d. But when related to basic wage rates (which vary with the cost of living) we find that 17/9d. was 20% of the 1929 basic wage, while 18/10d. is only 15% of the existing basic wage. Thus, the real costs of train travel for the single journey, as for the return journey, are less now than they were twenty years ago.

S. R. NICHOLAS,
Secretary for Railways.

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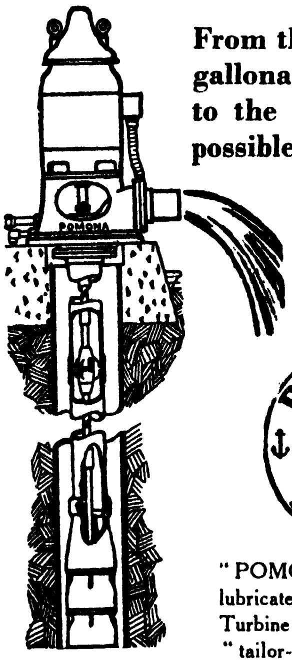

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the disease, will, on injection into others, cause the whole range of manifestations. This is the generally accepted view, but there is also evidence to support the view that more than one virus is involved.

It does appear that under some conditions one particular form of the disease will predominate in a flock. A few workers advance evidence in support of their theory that some forms of the disease are not caused by a virus.

Predisposing Causes.

Susceptibility to the disease is inherent, and workers have succeeded in producing both highly resistant and highly susceptible strains of birds.

The presence of coccidiosis has been demonstrated in many outbreaks of leucosis and some authorities claim that leucosis cannot occur in its absence. They contend that the coccidia facilitate entrance of the virus into the bird's system by means of the damage they cause to the intestinal wall.

While it is true that many outbreaks of leucosis are associated with coccidiosis and the parasite may play a role as described above, it has been clearly shown that the disease can occur in the absence of the former agent. It is quite possible that oocysts (resting stage) of coccidia carry the virus of leucosis, and this would account for the survival of the virus in fowl runs which have been unoccupied for some time. Roundworms and tapeworms may play a similar role to coccidiosis by causing damage to the wall of the bowel.

Insufficient quarantine between young and adult stock, rearing young stock on ground recently run over by adult birds, overcrowding, poor sanitation, nutritional deficiencies and other disease conditions—all these factors may predispose birds to infection and result in increased losses from the disease.

Infectivity.

The disease can be transmitted by running susceptible birds on ground previously inhabited by infected birds and by birds feeding on infected faeces. Spread from bird to bird it can also be brought about by blood-sucking insects such as red mite, fowl tick, and mosquitoes. Similarly, instruments used in fowl pox vaccination have been shown to spread infection from an affected bird to a large number subsequently vaccinated. Vaccination against infectious laryngotracheitis could be incriminated on the same score.

Transmission of the disease through the egg is backed by much reliable evidence, but according to some workers, this view has yet to be proved.

It should be borne in mind that some birds which contract the disease show only slight or even no symptoms. These "carriers" can play an important and serious part in the spread of the disease. This calls for vigilance during culling operations with young stock to detect and remove from the flock any birds showing even the slightest symptoms.

Susceptible Birds.

All the common breeds of fowls, game, bantams, geese, turkeys and pheasants have been shown to contract leucosis. Birds appear to be most susceptible to the disease during the first six or eight weeks of life. From this stage onward they show an ever-increasing resistance to infection and it is apparently difficult to transmit the disease artificially to birds over one year old. However, the disease can spread from bird to bird among adult fowls under natural conditions, and this factor must be taken into consideration when a control programme is proposed.

Susceptibility or resistance to the disease is to a large extent inherent. As mentioned previously, it has been found possible to breed strains of birds with a high resistance to the disease and on the other hand, strains which are extremely susceptible. Crossing a very susceptible with a very resistant strain produced progeny which were intermediate in susceptibility, proving that there are a number of inherited factors involved.

The heavy breeds of fowls are in general more susceptible than the light breeds. Crosses between light and heavy breeds are more resistant than the parent heavy breed. In many cases, the vigour produced by crossbreeding is reflected in a very high resistance to leucosis, and this disease resisance is one reason for the increasing demand for crossbreds.

The Course of the Disease.

The period elapsing between time of infection and first appearance of symptoms

(the incubation period) is extremely variable and may range from four to five weeks, to more than a year.

At times the disease assumes "outbreak" or epidemic proportions and big numbers may be lost over a short period. The general rule, however, is an intermittent loss of a few birds which may range from three weeks to twelve months of age—rarely older. It is this insidious persistent loss which stamps leucosis as a much more serious foe to farmers than the more acute "killing" diseases such as pullorum disease or coccidiosis, where epidemics command immediate attention.

Birds Affected with Paralysis.

All these birds are alive.

Gaping is due to affection of the nervous mechanism which controls respiration.

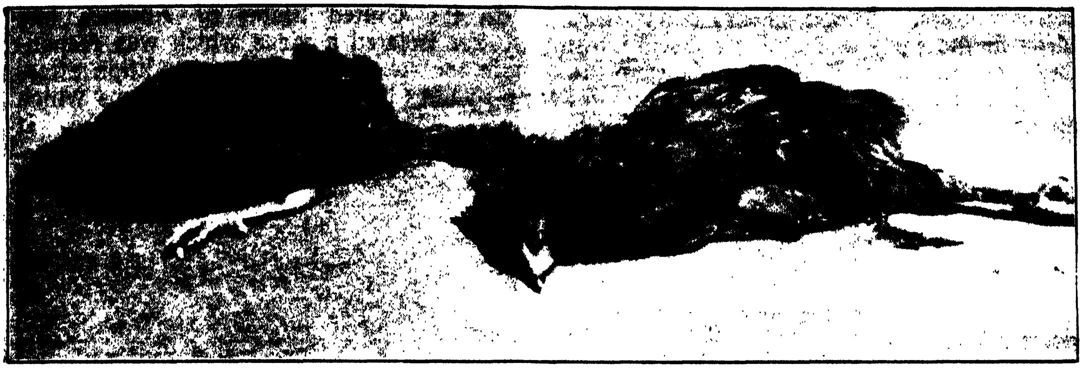
Symptoms and Post-mortem Appearances.

Fowl Paralysis.—This form features a progressive paralysis of the wings, limbs or neck, depending on which nerves are affected. Typically, control of the affected part is lost; later the muscles may become rigid and finally flaccid and limp. The neck may be held in a twisted position and in mild cases of limb paralysis the walk is staggery. Where the nerves supplying the gut are affected, constipation and later diarrhoea result. Gasping may also be evident.

Paralysis generally affects birds of from two to five months old, but it has been observed in birds as young as three weeks of age, and as late as the second year. While some birds may recover from this form, most lose condition and finally die, the mortality rate ranging from 5 to 25 per cent.

In uncomplicated fowl paralysis little is found at post-mortem examination. Organs are generally normal but affected nerves (particularly the sciatic or leg nerve) may show a localised or diffuse greyish soft swelling.

Ocular Lymphomatosis (*Pearly Eye or Iritis*).—Here the nervous tissue of the brain and eye are affected and blindness results. In the normal eye the iris is a clear bay or orange colour and the pupil is circular and reacts to different light intensities. An affected eye shows a fading of the normal iris colour due to infiltration of the structure with the characteristic leucotic blood cells. The pupil is irregular in shape and cannot accommodate itself to different light intensities. In advanced cases the iris shows a diffuse greyish opacity and the pupil becomes pinpoint.



Advanced Cases of Paralysis.
Both birds are alive, but unable to stand.

It must be emphasised, that the irregularity of the pupil is a better guide to infection with leucosis than the colour of the iris, because depigmentation of the latter does occur during heavy laying.

This form occurs in flocks affected with the paralysis form but generally later in the life of the birds. It has occurred, however, as early as the fourth week of life. Some outbreaks of pearly eye are not associated with other manifestations, but they should be regarded seriously, since the affected birds are potential carriers and the next generation may develop the more serious and fatal forms.

Visceral Lymphomatosis (Big Liver Disease).—This type generally occurs later than the paralysis or eye forms but has been reported as early as the fourth week.

Symptoms are indefinite; the comb may shrivel and darken, diarrhoea and jaundice or yellowing of skin, dropsy, loss of appetite and body condition may be seen. Some birds linger for a period before death occurs, while others succumb in a few days. Others again are found dead on the nest without exhibiting any prior symptoms.

Post-mortem appearances vary considerably. The spleen may be enlarged and greyish brown with milky thickenings in the capsule, or it may show definite grey areas throughout its substance. The liver is markedly enlarged and flecked with spots of a lightish colour. In other cases, large patches of liver tissue are abnormally pale. These changes render the liver very liable to damage and, not infrequently, portion of the organ will rupture, resulting in a fatal internal haemorrhage. Tumour-like masses may occur in other organs such as the ovary, kidneys and intestines.

Wasting Disease.—This form includes erythroleucosis and myeloid leucosis. Symptoms noted include anaemia (pale or bloodless), gradual loss of appetite and body condition, weakness and inactivity, finally leading to emaciation and death.

Generally, there are few changes visible to the naked eye at post-mortem examination, but microscopic examination of blood from affected birds reveals the presence of an abnormal number of immature blood cells. There is a corresponding increase in the amount of bone marrow above normal, and this has a greyish discolouration. Haemorrhages are often present in the small intestine, and tumour formation can occur in various body organs.

Big Leg (Osteopetrotic Lymphomatosis).—This form is seen occasionally in maturing pullets and cockerels. The shank bones become enlarged to two or three times their normal size. This condition should not be confused with scaly leg, which is a thickening of the shank through chalk-like deposits and is caused by a tiny mite.

Differential Diagnosis.

All other possible causes of paralysis should be eliminated. Spirochaetosis (fowl tick fever) is a common cause of paralysis in the western districts of this State, but it is characterised by a sulphur or lemon-coloured diarrhoea and this is absent in fowl paralysis. The enlargement of the spleen and the liver in both diseases may cause confusion, but the presence of ticks or red mite will throw suspicion on

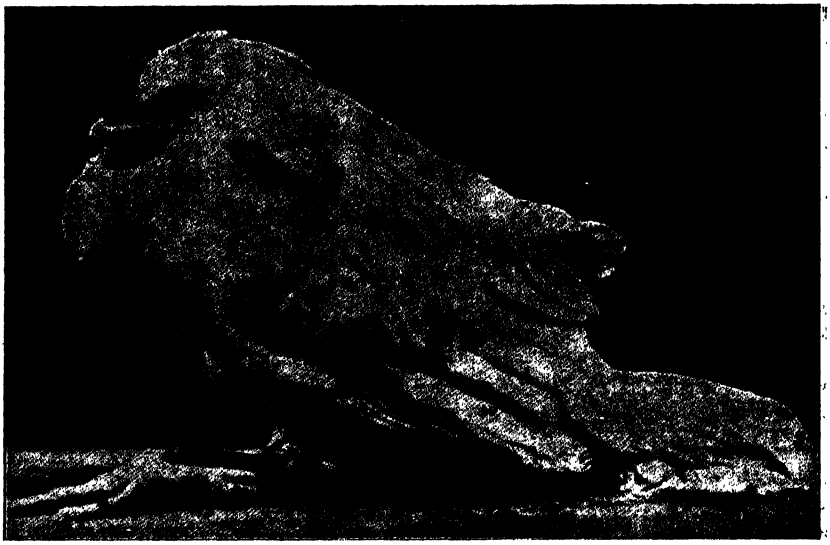
spirochaetosis. Blood smears taken from birds in the early stage of the disease will show the presence of the causal organism.

Other conditions causing paralysis are: an acute deficiency of Vitamin A; rickets (due to faulty diet or insufficient sunlight); very heavy infestations with tapeworms and roundworms in young stock; tuberculosis; water bag; ruptured oviduct; mechanical injury; nephritis and heavy infestation with head lice.

Septicaemic pullorum disease in adult stock produces an enlargement of the liver which may be confused with leucosis. Similar remarks apply to cholera.

In the United States of America one worker isolated a virus which was responsible for "chick disease", a condition affecting young birds and causing lesions which resembled those of pullorum disease. It responded to treatment with sulphonamide drugs but its relationship with leucosis is doubtful.

The rather lengthy list of possibilities which may be mistaken for leucosis calls for great care when investigating the disease. Thorough post-mortem examinations will eliminate most, and poultry farmers are urged to avail themselves of veterinary services for this purpose.



Bird Experimentally Infected, and Showing Advanced Symptoms of Leucosis.

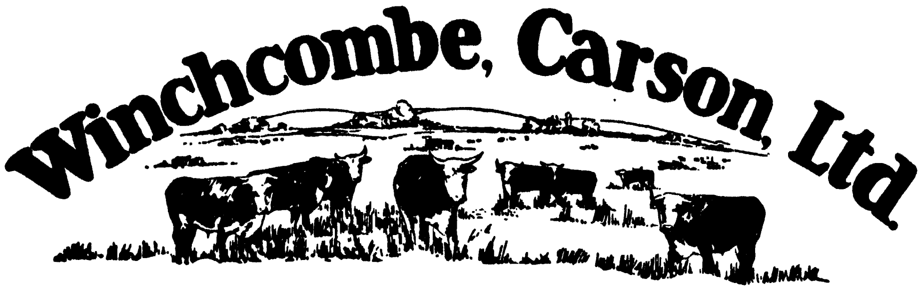
(*To be concluded*).

Spring Care of Sown Pastures.

PROPER management is imperative if the full benefit is to be obtained from money spent on pasture improvement. If pasture mixtures sown in the autumn have made normal headway, vigorous growth will be made in the spring, during which period stocking should be regulated to control the seeding of the various species as desired.

Sown pastures may be stocked as soon as the plants have made sufficient root growth to withstand grazing, and it is preferable to commence by turning in a fairly large number of stock and leaving them in the paddock for a short time only; they must be removed as soon as the growth is shortened back. Regulated grazing in the early stages encourages the plants to stool out and make stronger growth. Stock should not be turned on to the young grasses and clovers if the weather is wet and the ground boggy and soft, for the tramping under these conditions will kill out many of the plants; when the land settles down and becomes firm, the liability of plant damage from this cause is reduced. As the plants develop, the stocking periods can be lengthened until eventually normal grazing can be carried out, which, however, should be rotational.

During the early grazing periods it is advisable to observe closely the grazing behaviour of the stock, and in the event of too much attention being given to comparatively slow growers such as *Phalaris tuberosa* they should be removed for a time.



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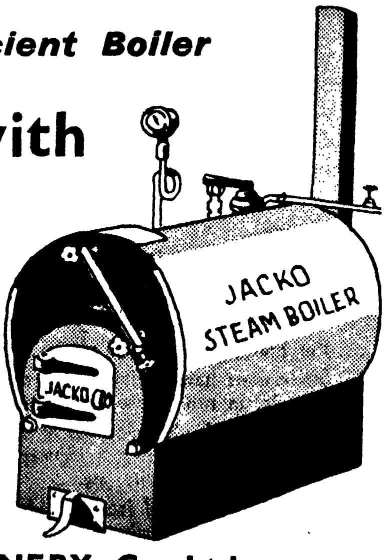

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Tubercle-free Herds.

The following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys) ...	107	19/8/49
Bathurst Experiment Farm ...	46	29/6/49
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys) ...	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys) ...	121	14/7/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires) ...	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys) ...	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ...	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.) ...	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys) ...	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns) ...	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.) ...	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians) ...	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires) ...	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus) ...	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns) ...	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys) ...	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys) ...	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys) ...	49	8/5/49
New England University College, Armidale (Jerseys) ...	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys) ...	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns) ...	106	29/12/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus) ...	61	2/2/49
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus) ...	309	16/8/50
Riverina Welfare Farm, Yanco ...	55	6/12/49
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus) ...	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns) ...	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys) ...	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus) ...	190	7/2/50
Wagga Experiment Farm (Jerseys) ...	66	1/4/49
White, H. F., Bald Blair, Guyra (Aberdeen-Angus) ...	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys) ...	67	26/4/49
Yanco Experiment Farm (Jerseys) ...	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns) ...	17	20/3/49

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Aboriginal Station, Wallaga Lake ...	14	20/9/49
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown ...	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School) ...	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell ...	33	28/7/49
Coventry Home, Armidale ...	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell ...	14	14/5/49
Daley, A. J., Lealands, Inverell ...	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Mt. Penang Training School ...	29	25/2/51
Dodwell, S., Wagga ...	91	8/3/49
Donnelly, J., Brodie's Plains, Inverell ...	34	5/4/49
Emu Plains Prison Farm ...	141	23/4/49
Fairbridge Farm School, Molong ...	33	9/4/49
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown ...	14	27/4/49
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/48
Genge, G. L., Euston, Armidale ...	32	8/10/49
Goulburn Reformatory, Goulburn ...	7	25/6/49
Grant, W. S., "Monkittee," Braidwood ...	24	10/5/49
Hague, R. T., Balmoral, Tilbuster ...	39	12/4/49
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell ...	60	13/6/49
Hart, K. H., Jersey Vale, Armidale ...	25	8/10/49
Hunt, F. W., Spencers Gully ...	63	17/3/50
Ince, F., Hillgrove Road, Armidale ...	33	8/10/49
Ince, W. G., Kirkwood St., Armidale ...	11	12/4/49
Jemalong Station, Forbes ...	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale ...	23	8/10/49
Kenmore Mental Hospital ...	31	27/7/49
Koyong School, Moss Vale ...	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud ...	73	12/3/49
Lucas, L., "Braeside," Armidale ...	27	8/10/49
Lunacy Department, Callan Park Mental Hospital ...	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital ...	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital ...	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell ...	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood ...	31	13/8/49
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
McMillan, N., Duval Road, Armidale ...	32	8/10/49
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale ...	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell ...	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Murray, J. A., "The Willows," Keiraville ..	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Police Boys Club, Kurrajong... ...	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
Rolfe, C. D., "Rose Farm," Inverell ...	31	17/3/50
St. Ignatius' College, Riverview ...	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie ...	8	12/7/49
St. John's Hostel, Armidale ...	7	8/10/50
St. John's Orphanage, Goulburn ...	21	13/4/49
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., " Hill View," Fig Tree ...	54	5/4/49
Tanner, F. S. Dural Rd., Armidale	42	8/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., " Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., " Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., " Spring Hills," Camden	61	7/12/49
Waddell, W., " Afton," Oakwood Rd., Inverell	127	5/7/49
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, F. J., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/49
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., " Birida," Armidale ...	39	12/4/49
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Hygiene in the Dairy.

SOME dairy farmers still fail to recognise the high susceptibility of milk to contamination and the necessity for hygiene on the dairy farm. Observance of the following recommendations will do much to safeguard quality of dairy products:—

Keep the premises and surroundings as free as possible from dust, manure, flies, stale milk, etc., as contamination from these sources gives rise to objectionable flavours in the milk. Particular attention should be given to dirty push-rod handles of the bail doors, as well as leg ropes, breechings, etc.

Where possible, provide a water supply sufficient to clean thoroughly the floors and all concrete yards, drains, etc., as well as the utensils. For the latter, rain water is strongly recommended.

Provide a supply of boiling water sufficient for thorough sterilisation of all utensils, plant, etc. A large copper or boiler is best for this purpose, with preference for a large, bricked-in copper, conveniently situated.

Cans, after scalding, should be inverted on the rack for about one minute to drain, then turned up for another two or three minutes to allow moisture to evaporate and then replaced on the racks—otherwise moisture will condense on the inside of the cans, and by the following milking will be "musty."

Never place one bucket over another, as they cannot air in such a position and the bottom rim of the lower bucket will cut the tin of the upper one.

Watch for faults developing in the utensils, such as cracks around the inside of can lids, around the outside of the top rim of buckets, and other places where harmful bacteria find ideal breeding grounds.

Too much stress cannot be placed on the necessity for good drainage and concrete yards; cobbled yards and floors are unsatisfactory, owing to the extreme difficulty of adequate cleaning.—DAIRYING DIVISION.

IF conditions are favourable, introduction of young well-bred queen bees in autumn will ensure a good force of young workers for winter-rearing during the coming spring. It will prove an advantage, too, should the beekeeper decide to work a winter honey flow, as colonies headed by vigorous young queens will stand up to trying conditions much better than others.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Guernseys)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	30
Evans, C. A. & Sons "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	62
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	26
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	39
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Von Nida, F. E., Wildes Meadow...	30
Wagga Experiment Farm, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	92
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm (Jerseys)	89
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callen Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Salway, A. E., Cobargo (Jerseys)	39
Rydalmere Mental Hospital, Rydalmere	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

"Drifting" of Bees.

IT is often complained that the production of bees in a certain row of hives never comes up to that of those in others. A common cause is that some obstruction near the apiary has resulted in what is known as "drifting." Bees returning from the fields loaded with honey travel in a direct line, and obstructions such as trees, fences, etc., may throw them out of their course, and being heavily burdened and tired they will enter the most convenient hive to give up their stores. Perhaps on the next trip they will return to their own hive, but this periodical diversion appreciably reduces production in the hive to which they belong.

The manner in which drifting bees enter a strange hive usually renders them immune from attack; they have not the nervous movement of robber bees, and so come and go unmolested. Where some colonies show little progress, drifting should always be suspected as a cause.—W. A. GOODACRE, Principal Livestock Officer (Apiculture).

Galvanised Burr in Mitchell Grass Seed.

FOR the first time in the history of the Department's seed testing laboratory, Galvanised Burr (*Bassia birchii*) seed has been found as an impurity of agricultural seed.

A small consignment of Mitchell grass seed sent from Queensland to a New South Wales firm was found to contain about 3,500 burrs per pound.

Galvanised Burr is a "declared" weed under the Local Government Act, but not a noxious weed under the Agricultural Seeds Act. Now that it has appeared in agricultural seed, action is to be taken to include it in the noxious weed schedule of this Act.—DIVISION OF PLANT INDUSTRY.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd ha been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Cocks, F. D., "Condalarra," Miranda.
Croft, F., Lugwardine, Kentucky.
Draper R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Garrison Battalion (2nd), Manly.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Experiment Farm, Wagga.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Gwandalan," Grenfell.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Rodents Attack Tomatoes Growing on River Banks.

MICE and rats have attacked irrigated crops of tomatoes growing along the banks of the Lachlan between Cowra and Forbes. In many cases damage caused by rodents was greater than loss from insect pests.

The damage is most pronounced in crops close to the river banks, and here it appears that rats are the main culprits. The fruit is attacked only when well coloured or ripe.

This is the first instance that has come under notice of rats and mice causing serious damage in tomato crops. It may be that the trouble is seasonal only, but it seems more likely that in some locations at least growers in future will have to adopt control measures against these pests.—W. L. MORGAN, Entomologist.

Soil Sterilisation Against Eelworm.

Efficiency of D.D. Tested.

D.D. has been shown to give good results as a soil fumigant against the root-knot nematode (*Heterodera marioni*) in a recent experiment carried out by the Biological Branch of the Department.

The fumigant was applied to the soil at the rate of approximately 50 gallons per acre and tomato plants were sown in fumigated and non-fumigated plots three weeks later.

Subsequently a fumigated and a non-fumigated plot were dug up. The roots of plants grown in the fumigated plot were found to be almost 100 per cent. free of nematodes, whilst those of plants in the control plot were fairly heavily infested.

D.D. is a by-product of mineral oil refineries and is marketed in Australia at a cost of £1 1s. per gallon. There is considerable overseas information establishing the efficiency of this chemical as a nemicide, but apparently it has little or no value as a fungicide.

THE AGRICULTURAL GAZETTE FOR MAY, 1949

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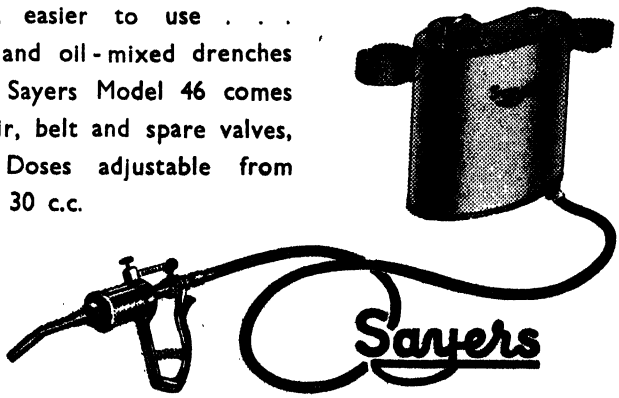

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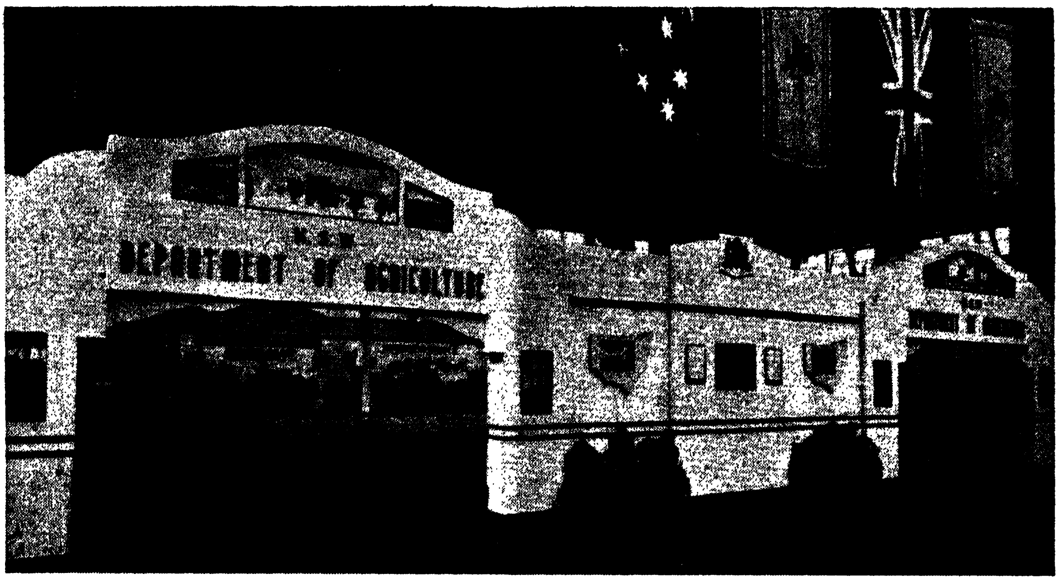


The Agricultural Gazette
OF NEW SOUTH WALES.

MAY, 1949.

THE DEPARTMENT At the Royal Show.

THE Department's Court at the Royal Show drew very favourable comment from the Royal Agricultural Society, the public, press and radio.

The Court's sixteen bays presented, colourfully and in modern display form, typical examples of the free services rendered primary producers by the Department's several Divisions.

The Department's main job has to do with the man on the land . . . . to help him improve his methods, his crops, his stock, and consequently his financial position and living standard.

The Department does another big job, one not so widely recognised. That job has to do with the consuming public . . . . to give consumers better food, whether it be meat, bread, butter, fruit, vegetables, honey, etc.

To cater for show-goers, among whom purely consumer interests far out-number producers, the exhibit aimed to interpret the achievements of the wheat breeder and the fat lamb raiser, for instance, in terms of a better loaf of bread, a more tasty and economical cut of meat, and so on.

DEPARTMENTAL DISPLAYS ILLUSTRATED.

ILLUSTRATIONS *of the* 1949 *Royal Agricultural Show are a feature of this issue.*

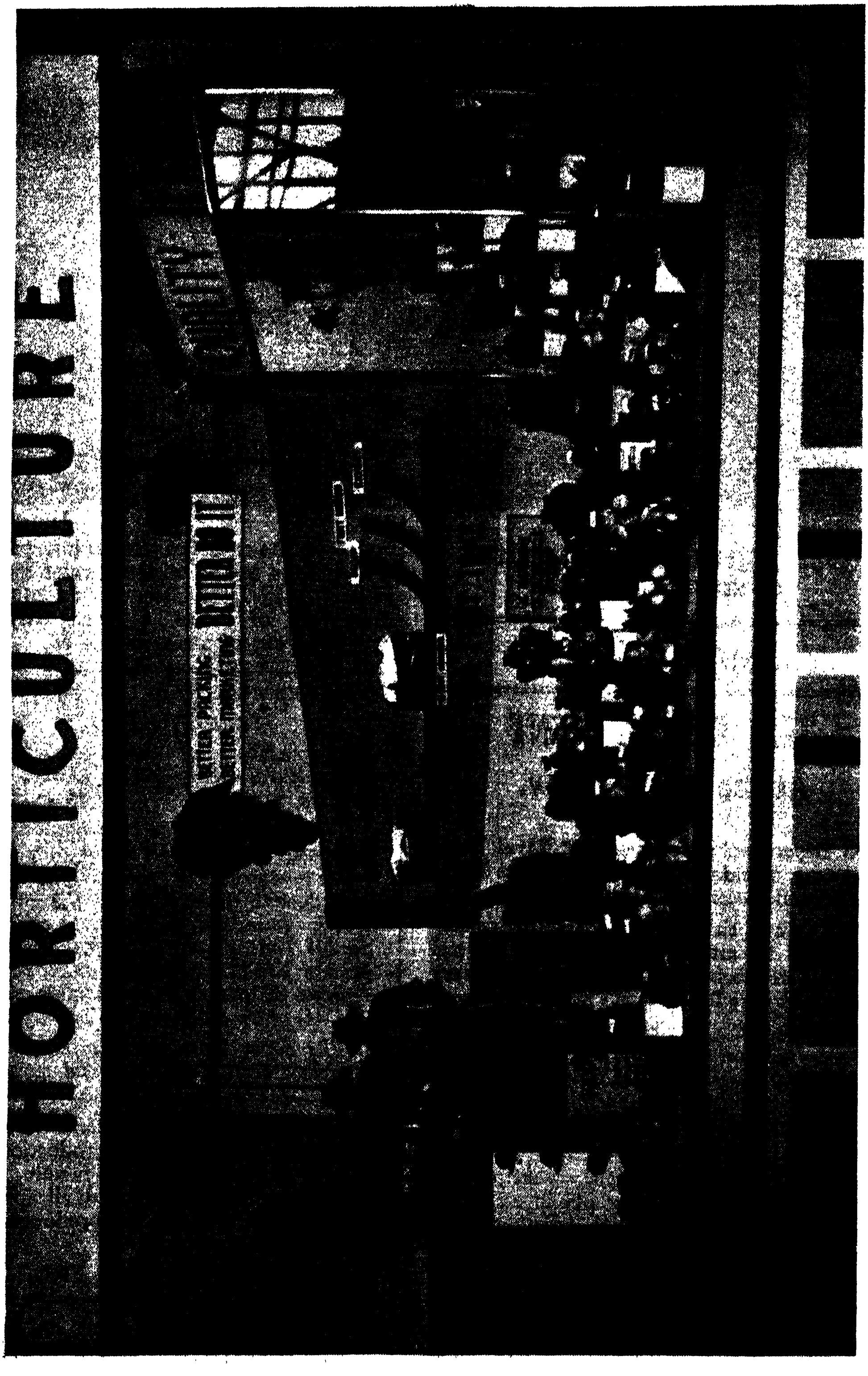
The displays staged by a number of divisions of the Department of Agriculture—typical of the sixteen presented—are illustrated on the pages which immediately follow, and a double page illustration of the grand parade of livestock—an outstanding feature of the ring programme each day—is given on pages 230 *and* 231.

The cover block of this issue also depicts a section of the grand parade.

Not only is the Department concerned with raising the quality of production, but also with the economics of farming, thus tending to combine quality with cheapness—of vital concern both to producers and consumers.

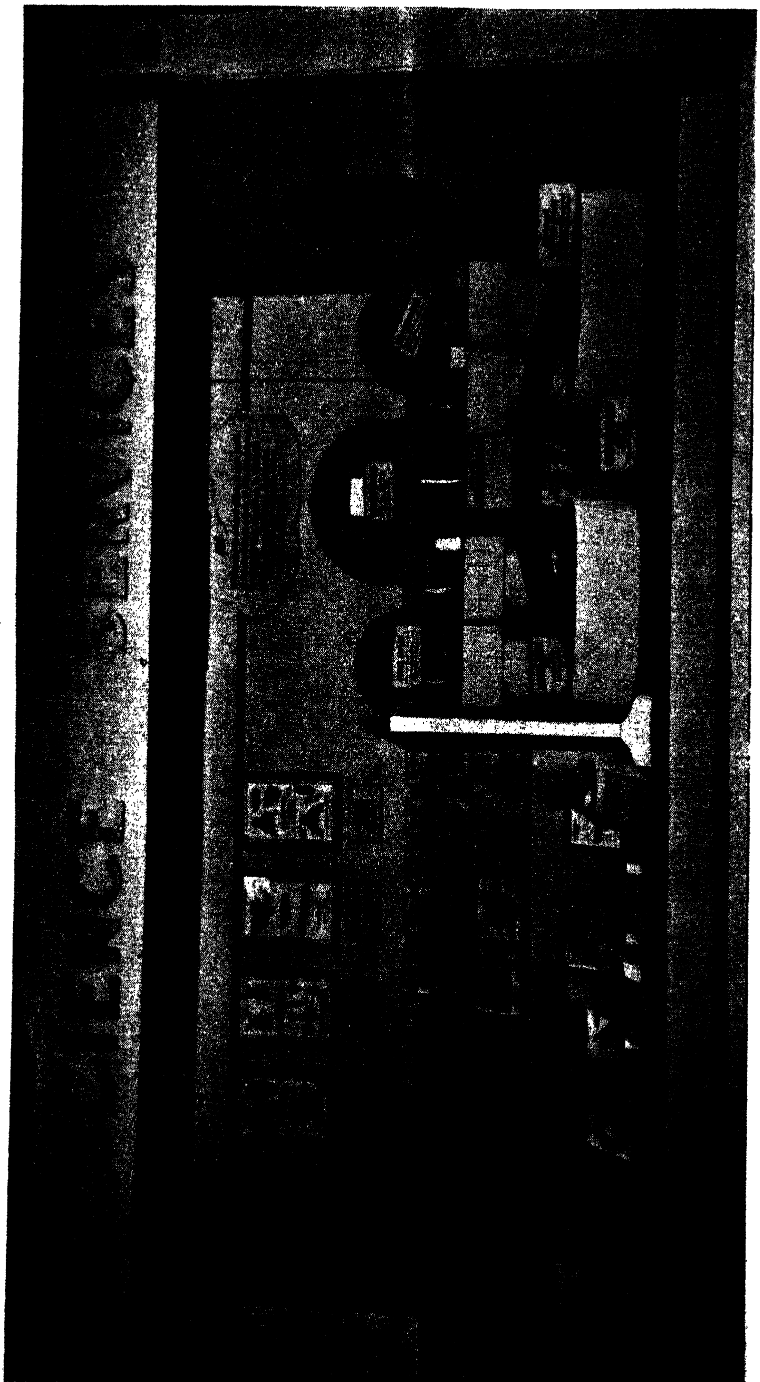
And all these services are FREE . . . . a point that was emphasised on every section of the display.

DEPARTMENT'S DISPLAYS AT THE ROYAL SHOW, 1949.

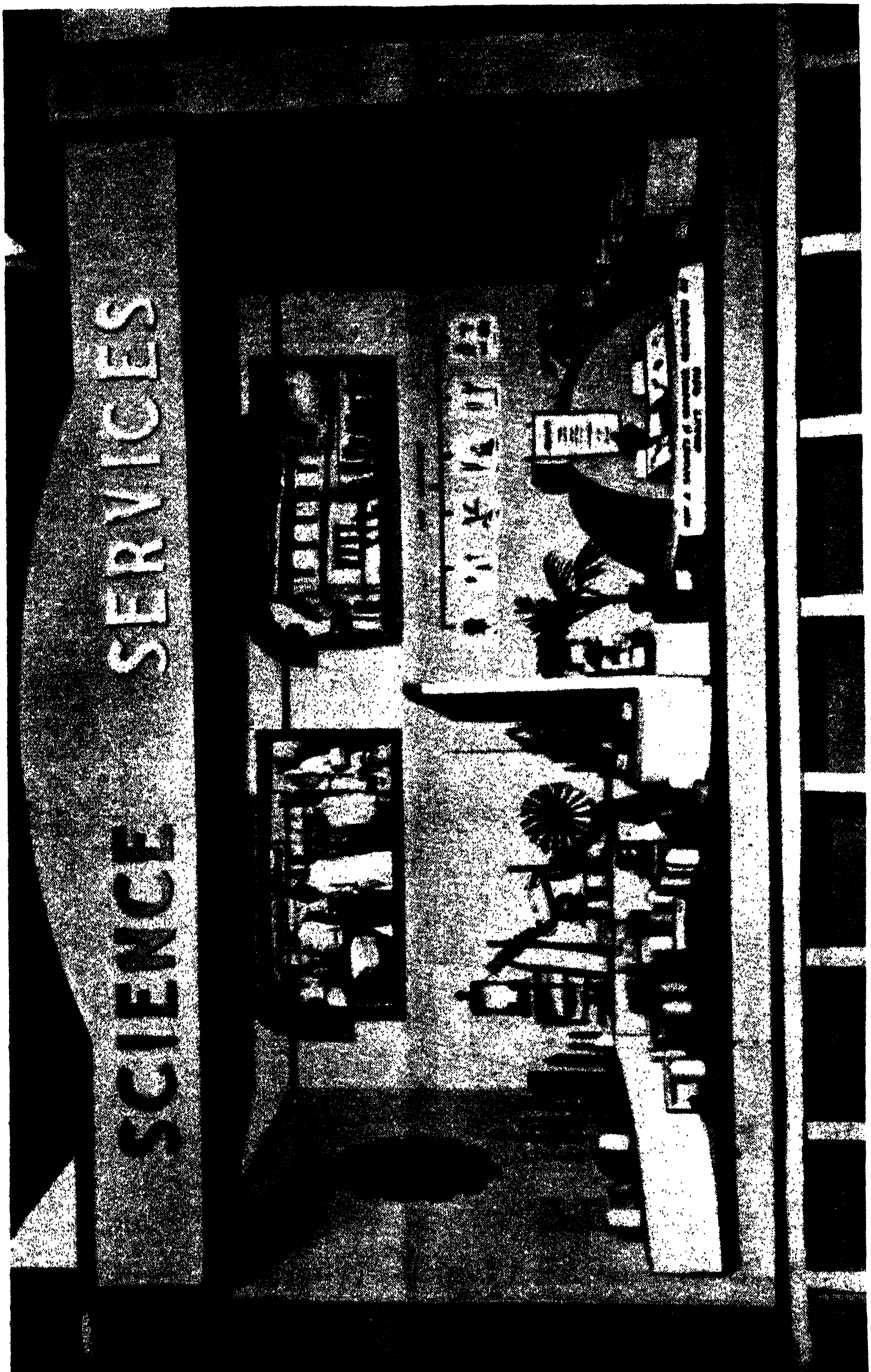


Attractive and Educational Display by the Division of Horticulture.

Production of Better Quality Livestock by Better Feeding, Better Breeding, Disease Control and Better Marketing was the theme of an Animal Industry Division Display.

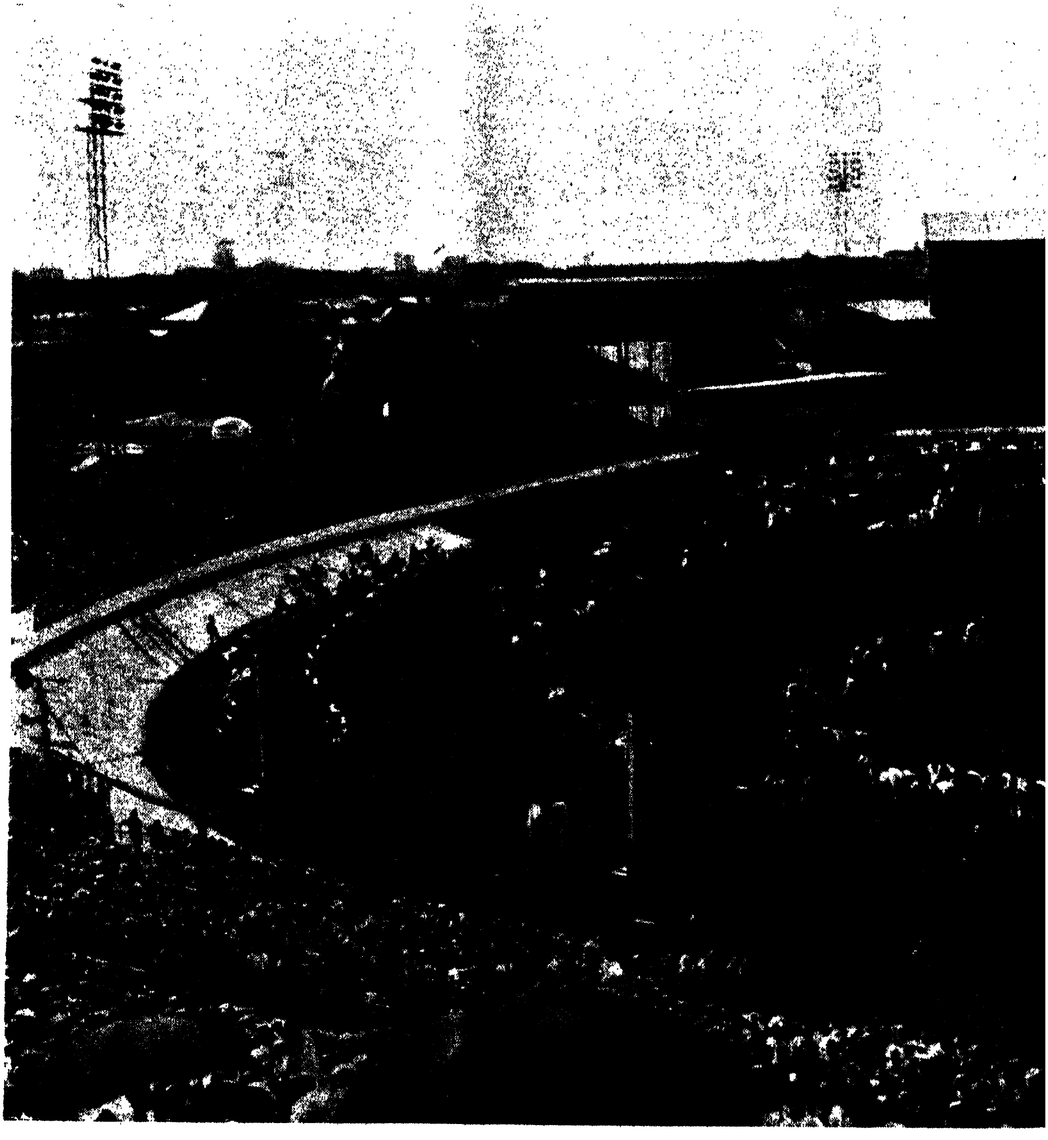


Instructive Displays were Staged by the Branches comprising the Science Services Division.
Insect pest and plant disease control problems were featured.



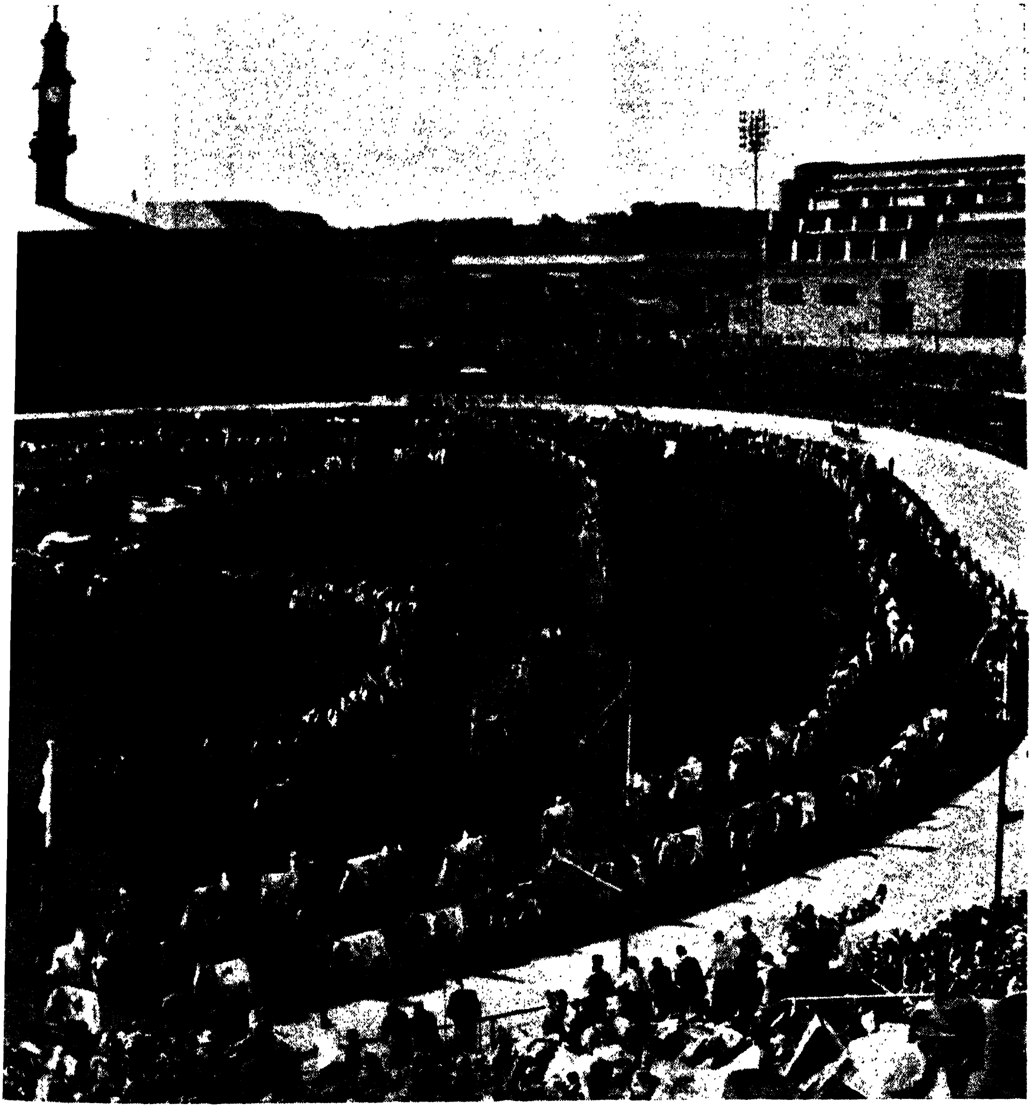
The Science Services Division Display indicated the Assistance which the Chemist's and Botanist's Branches can Render to Primary Producers.

THE GRAND
Royal Agricultural Society's



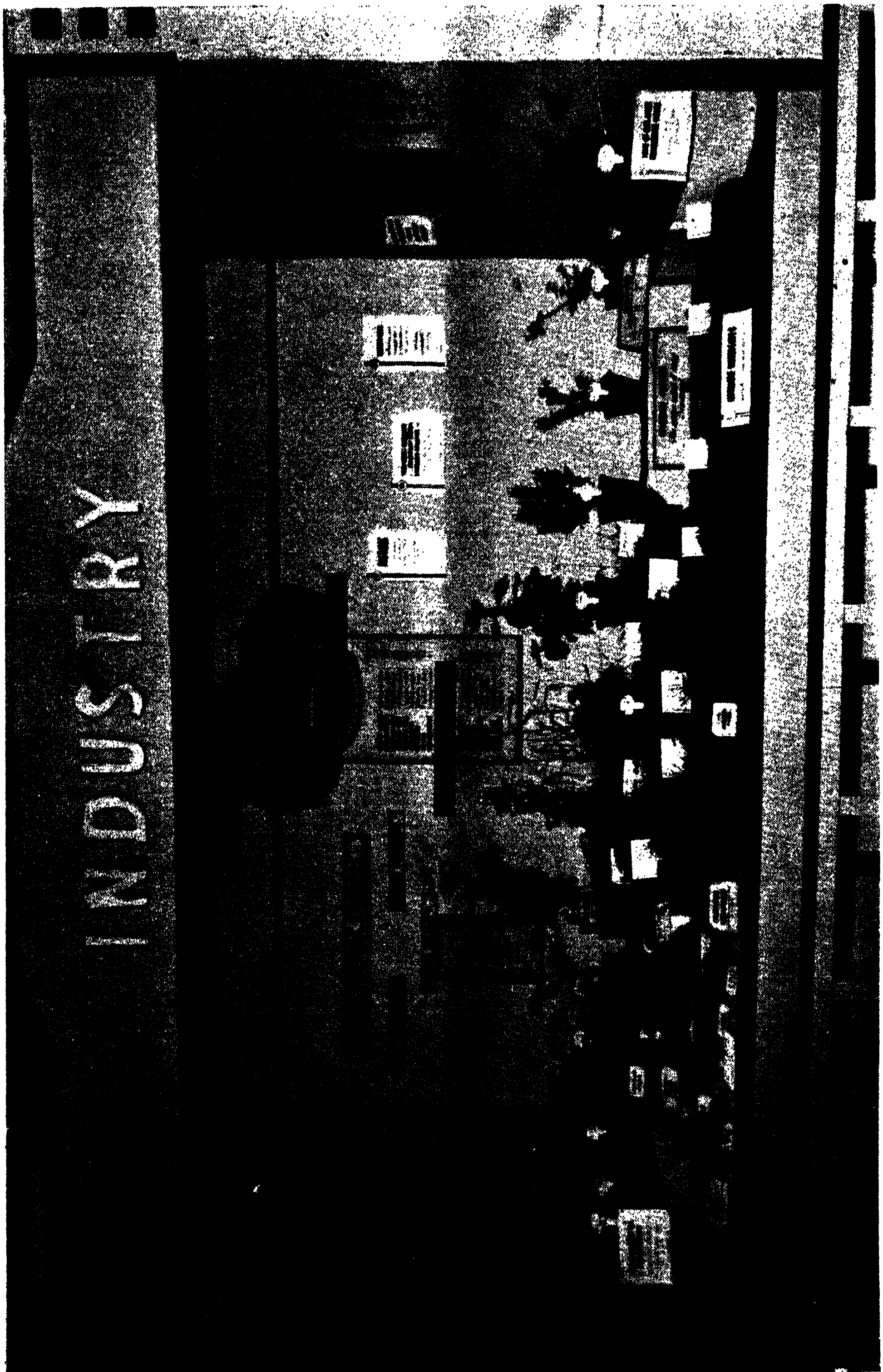
EACH day of the Show, a grand parade is held of out and described for the benefit of thousands of this magnificent

PARADE
Show, Sydney, April, 1949.



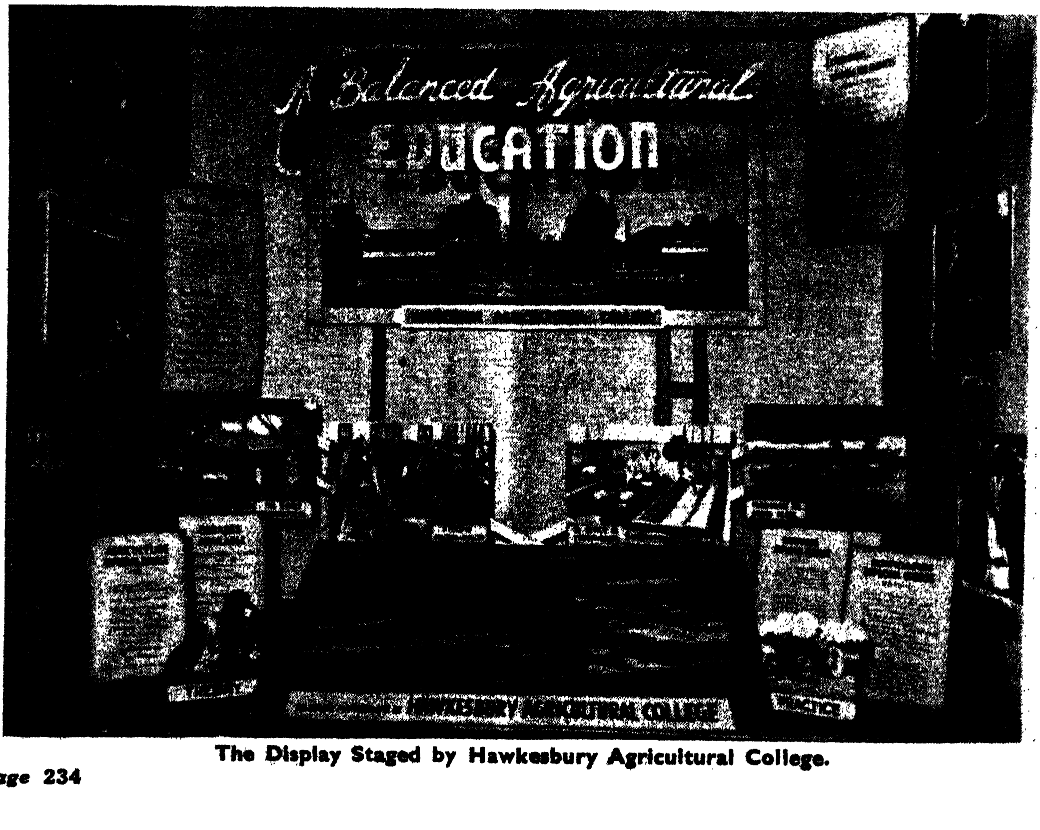
prize winning livestock, the animals being pointed
onlookers who crowd every vantage point to view
spectacle.

The Display staged by the Dairying Division featured the methods by which Milk Production can be Increased.

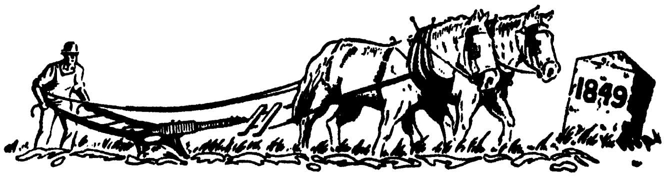


Interesting and Educational Displays were Staged by the Division of Plant Industry.

The Division of Marketing and Agricultural Economics Staged this Display.



The Display Staged by Hawkesbury Agricultural College.



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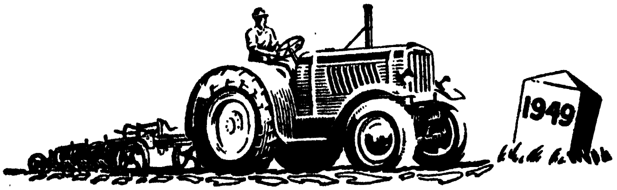

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FOOD AND AGRICULTURE ORGANISATION.

DIRECTOR-GENERAL VISITS AUSTRALIA.

AN interesting visitor to the Department last month was Mr. Norris E. Dodd of the United States of America, who is Director-General of the Food and Agriculture Organisation of the United Nations—an appointment which he has held since June, 1948.

Accompanied by M. Marc Veillet-Lavallee, Special Assistant to the F.A.O. Director-General, and Mr. Joseph L. Orr, Assistant Secretary-General of the International Emergency Food Committee, Mr. Dodd visited Australia as part of a world survey of food production.

During his brief stay in Sydney, Mr. Dodd and his officers attended a meeting of the State Committee of F.A.O., of which Dr. R. J. Noble, Under-Secretary and Director of the New South Wales Department of Agriculture is the Chairman.

Since taking office, Mr. Dodd has given great attention to perfecting the headquarters' organisation to make the best possible use of F.A.O's. resources, and to extending the Organisation's service to member governments through field officers in the main regions of the world. His administration has been notable, too, for the great progress made in planning concrete, long-term programmes of work for F.A.O. activities.

Before his election to head F.A.O., Mr. Dodd had been his country's Under-Secretary of Agriculture, since April, 1946. He had been associated with the administration of national farm programmes since 1933.

Mr. Dodd, who is an Oregon rancher, was head of the United States delegation to the Second Session of the F.A.O. Conference, held in Copenhagen, in 1946, and to the Third Session of the F.A.O. Conference in Geneva in 1947. Before his appointment as Under-Secretary of Agriculture, Mr. Dodd was director of the Field Service Branch of the Department's Production and Marketing Administration from August, 1945, and before that he served as chief of the Agricultural Adjustment Agency from June, 1943. This agency had a major responsibility for food production during the war.

M. Marc Veillet-Lavallee, a citizen of France, was appointed Special Assistant to the F.A.O. Director-General in August, 1948. His particular responsibilities include relations with member governments of F.A.O., with F.A.O. National Committees, and with other international bodies. He is Secretary to the F.A.O. Council, and Secretary-General of the F.A.O. Conferences.

(*Continued on page 241.*)

F.A.O. World Officials at the Department of Agriculture.
Left to Right.—Mr Norris E. Dodd, Director-General, M. M. Veillet-Lavallee, Special Assistant and Mr. Joseph L. Orr, Assistant Secretary-General.
Primary Producer Photo.

THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

FARM TENANCY REGULATIONS IN NEW SOUTH WALES.

SATISFACTORY relationship between tenant or sharefarmer and landlord is a factor which contributes substantially to the promotion of efficiency in primary industries. Exploitative methods of farming and the failure of the farmer to keep in step with new developments have often been attributed largely to unsatisfactory farm tenancy systems. When his occupancy of the farm is liable to be terminated at short notice and when there is no provision for compensation for the improvements he makes, the tenant, it is argued, finds no encouragement to carry out a farming programme with such long-range objectives as soil and pasture conservation and improvement or to provide such buildings and improvements as are necessary for efficient management.

Significance of the Agricultural Holdings Act.

Although there was some justification for this view in New South Wales until the passing of the Agricultural Holdings Act in 1941, failure on the part of the tenant to carry out his farming activities at a reasonable level of efficiency cannot be excused on the grounds of unfair tenancy agreements since that date. Only ignorance of the provisions of the Act or some quite different reason could be held responsible for such an attitude.

*As it is possible that many tenants and sharefarmers do not realise the protection and benefits which the Agricultural Holdings Act has made possible, a brief outline is given here. A more detailed explanation of the Act is set out in a publication issued by the Department of Agriculture entitled "Farm Tenancy in New South Wales."**

MAIN FEATURES OF THE ACT.

Rights of the Tenant to Compensation.

Tenant farmers and sharefarmers are entitled to compensation:—

(*a*) *For certain specified classes of improvements.*—

With regard to some of these improvements, advance notice in writing of the tenant's intention to carry out the improvement, must be given to the landlord. Concerning such major improvements as erec-

*This publication is available from the Department of Agriculture on request.

tion of buildings, silos, permanent fences, planting of orchards, construction of dams, etc., for water supply and irrigation, the landlord may not agree and the matter may then be referred to an Agricultural Committee established under the Act. The landlord cannot object to the tenant making such necessary improvements as domestic water supply, drainage, necessary roads or bridges, clearing of cultivation and pasture land and destruction of noxious weeds provided notice is given. Permission from the landlord is not required for effecting such improvements as liming, manuring, laying down of permanent pastures, erection of permanent subdivision fences, increasing the area of temporary pasture, building repairs, feeding of certain feedstuffs to cattle, sheep, pigs or horses.

Estimation of the amount of compensation payable to the tenant is based on the value to the incoming tenant of the improvements effected. Factors such as the cost of the improvement, its practical value on the farm, the amount of use the tenant has had, and the deterioration which has occurred are taken into consideration when assessing the amount of compensation to be paid to the outgoing tenant. If there is no replacing tenant the landlord must pay the compensation due. Any disputes which arise are settled by an Agricultural Committee.

(b) For hay, silage, roots, manure and compost stored on the holding at the end of the tenancy.—

A sharefarmer is entitled to a share of the value equivalent to his share of the produce of the land or the proceeds of the sale thereof, in accordance with the provisions of the share-farming agreement.

(c) For the increased value of the holding which may result from the tenant adopting a standard of farming higher than that required by his contract of tenancy.—

This claim must be supported by a comprehensive record of the condition of the holding at the beginning of the tenant's occupancy. It is required that the tenant give notice in writing to the landlord of his intention to claim this compensation. Improvement in the value of the property due to the continuous adoption of a special standard of farming would not react against the tenant in an application for revisal of rent by the tenant. (Revisal of rent may be obtained by application to the landlord and arbitration by an Agricultural Committee). Improvements which the tenant may have been compelled to make under his contract of tenancy would, however, be taken into account when considering this matter.

(d) For disturbance of tenure except on account of his failure to comply with certain obligations.—

Tenants with contracts of tenancy for less than five years may be compensated for disturbance of tenure even if they remain on the farm for longer than the period of the contract. This provision was designed to help eliminate the insecurity and instability of short-period tenancies by inducing landlords to offer tenancies for a period of five years or longer if they do not want to be liable to pay compensation for disturbance. Only when the tenant has failed to fulfil certain obligations is the landlord entitled to give notice to quit without being liable to compensation for disturbance.

Rights of the Landlord to Compensation.

The landlord is given the right to compensation for any deterioration in the value of his holdings which results from the failure on the part of the tenant to cultivate the holding according to the rules of good husbandry or the terms of the contract of tenancy.

The landlord must notify the tenant of his intention to claim such compensation before the tenancy is due to end. This right is in addition to the landlord's right to claim compensation for deterioration of buildings and failure of the tenant to carry out repairs agreed upon under the terms of the contract.

Security of Tenure.

Tenancies of agricultural land are to be for a minimum period of two years, subject to termination only on twelve months' notice except for certain reasons when shorter notice may be given.

The only circumstance under which a shorter tenure may be arranged is in the case of use of the property for agistment of stock, when a maximum term of only one year is permissible.

The tenant must give, or be given, notice of termination before the beginning of his

last year of tenancy. However, if notice is given by the landlord, and provided the tenant has fulfilled his obligations, the tenant is entitled to compensation for disturbance, unless the agreed term is five years or more.

Reviewal of Rent.

Provision is made for reviewing and determining, at certain intervals, the amount of rent to be paid for a holding.

The landlord must be notified and the question of the rent is referred to an Agricultural Committee. Should the landlord refuse to have the matter brought before the Committee and the tenant leave the property as a result of his refusal, the tenant is entitled to compensation for disturbance.

As a result of provisions under the Act the tenant can demand an arbitration as to rent every two years at most. The landlord also has the right to demand arbitration as to the rent to be paid for a holding.

Removal of Improvements Made by the Tenant.

Tenants and sharefarmers are given the right to remove fixtures and buildings affixed or erected by them, and for which compensation is not payable. They are not under any obligation to do so.

This does not apply when the tenant has erected the item in question under a previous agreement or in place of a similar item belonging to the landlord. The tenant must give the landlord one month's notice of his intention to move any building and allow him the opportunity of purchasing it at a fair value to an incoming tenant.

Settling of Disputes.

Provision is made for the constitution of Agricultural Committees to arbitrate on disputes arising under the Act between landlords and tenants or sharefarmers. An Agricultural Committee comprises a chairman (usually the District Agronomist) appointed by the Minister for Agriculture, and one landlord and one tenant farmer selected by the parties to the dispute from a panel of representative farmers.

When a landlord or tenant requires a dispute to be settled by an Agricultural Committee he should advise the Department of Agriculture of the dispute and give the name and address of the other party to the dispute. A form of notice of the dispute will then be supplied, with full instructions, and a copy of the appropriate panel will also be forwarded to him and to the other party. Each party is responsible for appointing his representative to the Agricultural Committee and for arranging for the payment of his representative. A scale of maximum fees has been fixed.

Limitation of Tenancy Agreements.

Any contract or agreement by which a tenant's rights under this Act are taken away or limited, is void.

Tenancy Agreements.

It is considered essential to the promotion of a satisfactory relationship between tenant and landlord that a written agreement be drawn up setting out clearly the principles or method of farming to be adopted and the conditions of the tenancy. It is particularly desirable that the agreement be drawn up to suit the special circumstances of each farm and that this be done by a qualified legal practitioner.

Points to Include in an Agreement.

1.—Names of parties to the agreement.

2.—Period of tenancy.

3.—Amount of rent, when and how payable.

4.—Cropping systems to be followed. It is desirable that a crop rotation suitable to the farm and the district be agreed upon with a view to conserving soil fertility.

5.—Treatment of grasslands. This refers to the renovation, liming and fertilising of permanent pastures. The tenant's rights in regard to ploughing up pasture land or established lucerne should be made clear in the agreement.

6.—Provision should be made for certain duties which come within the requirements of good farm management, but which should be, nevertheless, specified in the agreement. These include provisions—

(*a*) To ensure that the farm is cultivated in a thorough and workmanlike manner.

(*b*) To prevent the subletting of the farm, or any portion of it, without the permission of the landlord.

(*c*) For dealing with the maintenance of buildings, fences and other improvements.

(*d*) To ensure that care is taken of all trees, fruit trees, shrubs and vines; and that

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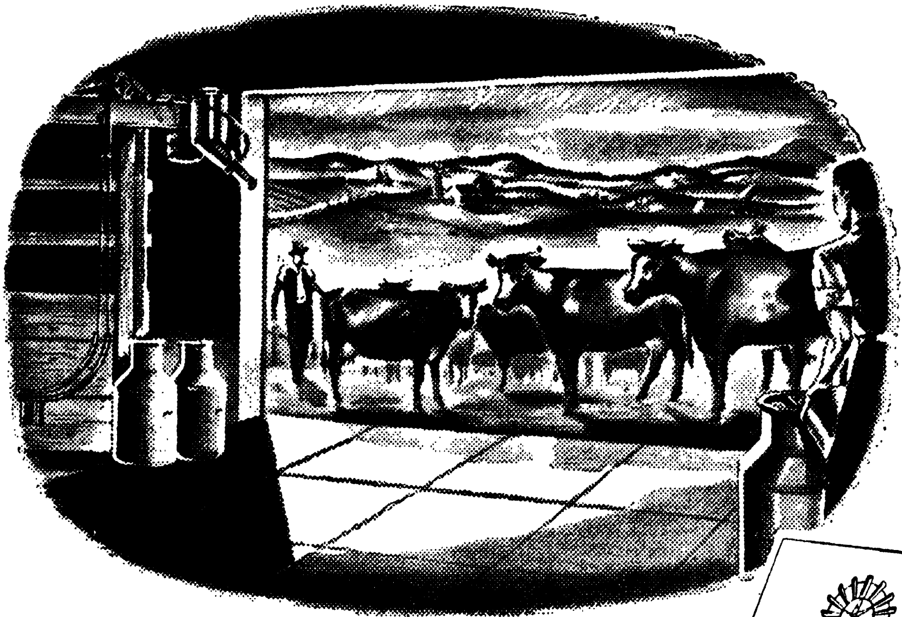

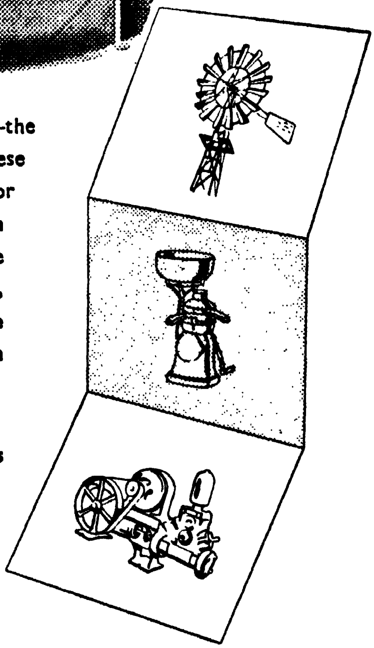

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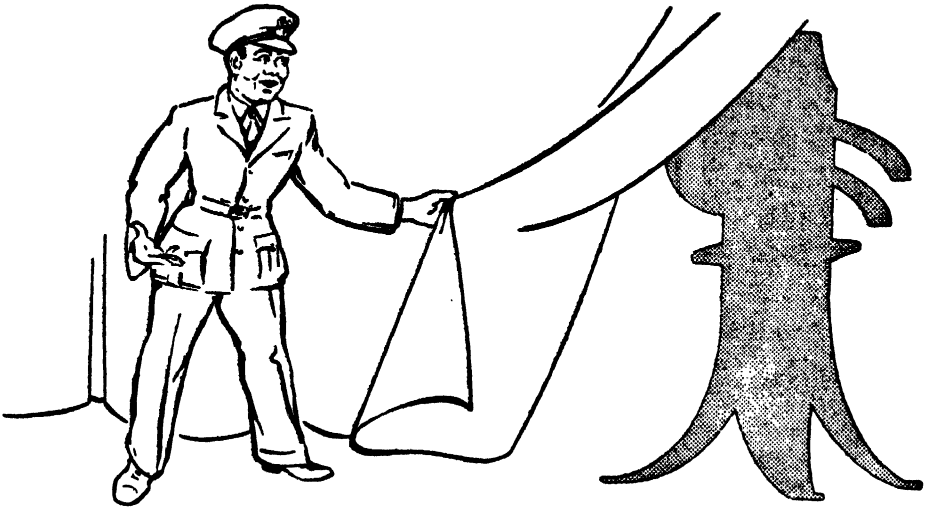

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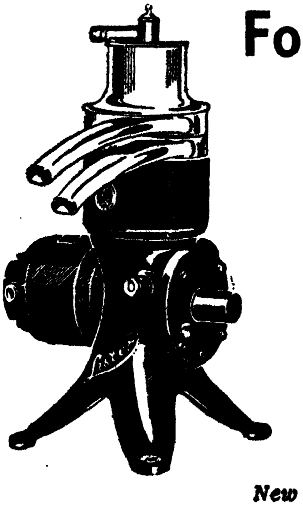

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growing trees are not cut down without the permission of the landlord.

(*e*) To ensure control of all noxious weeds and noxious animals, and the observation of all laws relating thereto.

(*f*) To ensure that all drains and water-courses are maintained in good condition.

(*g*) To prevent specified methods of tillage likely to result in soil erosion.

7.—Payment of insurances on buildings, Pastures Protection Board rates and taxes, the supply of materials required for repairs and improvements, the rights of the landlord to inspect premises and to make repairs and improvements.

8.—The right of the tenant to compensation for tillage, cultivation and standing crops not provided for under the Act.

9.—Supply of labour and materials for construction of or repairs to improvements as agreed upon by landlord and tenant or provision for compensation for same.

Sharefarming Agreements.

Dairy Farm Sharefarming Agreement.

Most clauses included in Farm Tenancy Agreement should be covered in this type of agreement, dependent on the particular circumstances and the degree of control which the landlord wishes to maintain.

Since the landlord usually supplies the livestock and as care of these is not provided for in the Act, it is desirable that, in addition to the provisions set out in the specimen dairy sharefarming agreement, published in March issue, the agreement includes specific instruction as to—

(*a*) The provision of home-grown fodders and the purchase and use of concentrates so that the herd will be adequately fed.

(*b*) The methods to be followed in rearing calves, maintaining growing heifers, and the feeding and care of "dry" cows.

(*c*) The proper control of bulls, and regulation of the breeding programme.

(*d*) Efficient and regular milking of the herd.

(*e*) The maintenance of dairy utensils, including milking machines, premises, and surroundings in a clean and sanitary condition.

The agreement should clearly indicate what and how much labour, equipment, materials and miscellaneous payments each is to contribute to the farm enterprise. It is most important that it should be quite clear exactly how the farm income is to be divided between landlord and dairy-farmer. It is wise to include clauses to cover such items as the authority of the share-farmer to buy and sell stock, banking arrangements, keeping of records covering the farm operations, and the marketing of farm produce.

Dairy Farm Manager—Sharefarmer Agreements.

Remarks concerning the drawing-up of tenancy and dairy sharefarming agreements are applicable in general to this type of agreement. The usual practice is for the manager-sharefarmer to be paid a wage corresponding to the amount he might earn as a farm hand, and, in addition, a share of the farm income. In this type of agreement, it is most important that the amount to be paid monthly to the manager should be stated, and the proportions in which it is decided to divide the net farm income at the end of the year, or any other period, agreed upon. Arrangements governing the handling of cash receipts and payments should be clearly defined. A clause defining the authority of the manager to sell or purchase livestock, hay, grain and farm produce generally is most necessary.

Crop Sharefarming Agreements.

(*a*) *Wheat Farming.*—This type of agreement is usually relatively simple as it covers one crop only. The sharefarmer agrees—

(i) To commence preparing the land before a stipulated date, to plough to a specified depth, to harrow the land thoroughly and to use seed and fertilisers at specified rates.

(ii) To cut a firebreak half a chain in width around the crop, the hay obtained thus to be shared between sharefarmer and landlord who receive two-thirds and one-third respectively.

(iii) To do any harvesting, carting, stacking and thatching if any of the crop is cut for hay. The hay is usually divided equally, but the landlord pays the farmer

an agreed amount per ton for cutting, stacking, carting and thatching the landlord's share of the crop.

(iv) To harvest the grain crop and to deliver the landlord's share to some place agreed upon. The proportion of the crop which each is to receive is stated in the agreement. As a bonus the sharefarmer is often given the surplus over an amount fixed by the agreement, not greater than a figure agreed upon, after which the division is again equal. The sharefarmer carts the landlord's crop to the rail or silos at a figure agreed upon.

(v) To supply half the fertiliser, bags and twine for his share of the crop and all machinery, implements, horses, materials and labour. The landlord agrees to supply all seed, fungicide, half the fertiliser and the bags and twine for his share of the crop.

Other clauses may include the landlord's right to complete the contract at the sharefarmer's expense should the latter fail to carry out any work to the satisfaction of the landlord, and the sharefarmer agrees to leave the land, and to remove all machinery, etc., at the end of the agreement.

(*b*) *Other Crops.*—The design of those agreements should be basically the same as the sharefarming agreements already described, with adaptation to suit the special conditions of the crops concerned. Where crops such as vegetables and maize are concerned, it is essential that a system of rotational cropping be decided upon and included in the agreement.

In the case of banana plantations and orchards generally, special clauses should be inserted in agreements covering the growing of green manure crops and the use of fertilisers, the measures to be adopted for the control of insect pests and fungous diseases and the observance of the law on these matters, the control of soil erosion, and the replacement of dead or worn-out trees, vines and stools. The obligations of either party in regard to the supply of seeds, fertilisers and chemicals should be clearly stated.

These recommendations should be used as a guide to what should be included in such agreements. It is essential, however, that the actual agreement be drawn up in correct legal form to suit the particular circumstances of each farm.

U.S. FARMERS MECHANISE WORK AT RECORD RATE.

THE United States Bureau of Agricultural Economics recently conducted a survey of machinery usage on United States farms. A summary of the results of this survey was published in the October, 1948, issue of "The Agricultural Situation." In view of the rapid expansion of mechanised methods of farming in Australia in recent years the results of this survey will no doubt be of interest to New South Wales farmers.

United States farmers switched from animal power to machine power and from hand methods to machine methods more rapidly in the past ten years than in any other decade in history. In 1948, they were using more than twice as many tractors as in 1939. The numbers of many tractor-drawn machines on their farms were up even more.

Increased mechanisation during the past decade has been accompanied by a 40 per cent. drop in the number of horses and mules on farms. Furthermore, the amount of work done per animal also has declined. As a result, more than 60 per cent. of the farm work requiring tractor or animal power last year was being done with tractor machines.

Hand Work Declines.

Most of these increases, of course, were at the expense of animal-powered machines. Handwork also is on the decline. Although still important in cotton and potato production, and in the corn harvest, hand methods are used very little in other crop jobs covered in the study.

In both 1939 and 1946, a higher proportion of the heavy draft jobs like ploughin, listing, bedding, and discing was done

with tractor machines than the lighter draft jobs like planting, cultivating, and harrowing. For the entire country, it is estimated that 82 per cent. of the breaking of land in 1946 was done with tractor machines and equipment compared with 55 per cent. in 1939.

Big Gain in Light Work.

Although farmers had about twice as many tractors in 1946 as in 1939, only 50 per cent. more land was broken with tractor equipment. However, use of tractor power for relatively light-duty jobs like planting corn, cotton and potatoes, and cultivating corn and cotton more than doubled.

Newer Tractors are Better for Light Work.

This reflects the increased use of rubber tyres on tractors and the fact that the newer tractors are more suitable for light-duty work. Most of the wheel tractors sold to farmers since 1939, have been equipped with rubber tyres. Many tractors which had steel treads in 1939 have since been equipped with rubber tyres.

Despite the tremendous increase in the use of tractor power for light-duty jobs, over half the corn and cotton was cultivated with animal-drawn machines.

Small grains were the most highly mechanised major crop in both 1939 and 1946. Farmers harvested about 90 per cent. of the 1946 acreage of small grains with tractor machines. About two-thirds of the total acreage was harvested with combines.

Corn producers have adopted tractor power rapidly in the last ten years. Farmers used tractor machines to plant only 13 per cent. of the acreage in 1939; in 1946, the percentage had risen to 43.

SOURCES OF POWER USED IN TEN FARM JOBS.

Operation.	Per cent. of work done with— Tractor machines.		Animal-drawn machines.		By hand methods.	
	1939.	1946.	1939.	1946.	1939.	1946.
Breaking land (ploughing, listing, etc.)	55	82	45	18	...	...
Discing	57	85	43	15	...	...
Harrowing (spike and springtooth)	43	77	57	23	...	...
Drilling small grains ...	49	79	51	21	...	...
Planting corn	13	41	81	56	6	3
Planting cotton	21	43	79	57	...	...
Planting potatoes ...	14	43	38	19	48	38
Cultivating corn	30	64	70	36	...	...
Cultivating cotton ...	21	45	79	55	...	...
Harvesting small grains ...	69	90	30	10	1	0·4

More Corn Pickers.

Of the corn-acreage farmers harvested for grain in 1946, mechanical corn pickers were used for 41 per cent. compared with only 12 per cent. in 1938 and 27 per cent. in 1943. The corn picker is used most extensively in the Corn Belt and Lake States where the yield per acre is much above average. For this reason, a higher proportion of the crop than of the acreage was harvested with corn pickers.

Although work animals still provide the bulk of the power for cotton in many areas, the large part of the seed-bed preparation, planting, and cultivating in Oklahoma, Texas, and the irrigated areas is done with tractor machines.

Food and Agriculture Organisation—*continued from page 235.*

Mr. Joseph L. Orr, a citizen of the United States of America, is Assistant Secretary-General of the International Emergency Food Committee—the Committee of the F.A.O. Council which recommends the international allocation of scarce foods and nitrogen fertilisers. He is also Assistant Director of F.A.O's. Distribution Division, which has as one of its duties the preparation of commodity studies and reports.

He came to F.A.O. from the United States Department of Agriculture, with which he served for twenty-five years.

- - KEEP SAVING FOR BETTER TIMES - -

CHINESE CABBAGE.

An Excellent Culinary Vegetable.

A. C. ORMAN, H.D.A., Special Agronomist.

FROM the standpoint of quick growth and palatability Chinese cabbage is an excellent vegetable. It may be used both as a salad and pot herb. It is also a valuable "in between crop" to ensure a continuity of green feed for poultry during difficult periods. By virtue of its early maturity it can be sown at periods unsuitable for other recognised green feed crops. Chinese cabbage is very adaptable, there being a few districts in which it will not thrive, given proper attention.

Climate and Soil.

Being naturally a cool climate plant, Chinese cabbage does best in the autumn and early winter, although good results are possible in the spring as well. The best soil is a rich loam well supplied with organic matter. However, the crop will succeed on most soils of average fertility, provided correct attention is given to nutrition. Chinese cabbage must be grown quickly, hence requires the best possible treatment. Irrigation is essential in most districts, especially those having a low and irregular rainfall.

Preparation of Soil and Sowing.

The area should receive a thorough preparation. Work the soil deeply at first and subsequently cultivate it as often as necessary to produce a fine, moist seed-bed. Soils which are acid should receive a dressing of agricultural lime or dolomite, at the rate of about 30 cwt. per acre. The material should be thoroughly and uniformly incorporated with the soil to a depth of 8 inches. During the preparation, advantage should be taken to apply cow manure, especially to sandy soils, for which a dressing of 20 to 30 tons per acre is not excessive.

Provided the soil is well prepared and free of weeds, the seed can be sown direct in the field, and the plants thinned when established. If this method is adopted, the seed should be sown ½ inch deep in drills spaced 24 inches apart, using seed at the rate of approximately 1 lb. per acre. When the plants are well established they should be thinned to 12 to 18 inches apart in the rows.

Should it be necessary to propagate the seedlings in beds for transplanting later, the seed-bed should be thoroughly prepared by working the soil deeply and raking it over to obtain a fine, moist, firm condition. Superphosphate at the rate of 1½-2 oz. per square yard should be thoroughly mixed with the soil before seeding. Sow the seed ½ inch deep in rows 6 inches apart and mulch with finely-divided animal manure. The aim should be to produce sturdy plants, and to do this thinning in the beds may be necessary. About 4 oz. of seed will provide sufficient plants for an acre.

The addition of artificial fertiliser is necessary in all districts where responses are obtained. A complete fertiliser, or one consisting of three parts of superphosphate and one part sulphate of ammonia, should be incorporated with the soil along the drills at the rate of 8 cwt. per acre. During growth a side-dressing with either well-decomposed poultry manure, at 10 to 15 cwt. per acre, or sulphate of ammonia at 2 to 3 cwt. per acre should be given to stimulate growth. With both, the side-dressings should be lightly worked into the soil when the heads commence to develop.

It is advisable to make successive sowings of Chinese cabbage at fortnightly or three-weekly intervals during the spring, summer and autumn to provide a continuous supply of the vegetable. It should be possible to sow from August until March on the tablelands, and from July to April in most other parts. In warm coastal districts, however, sowing could proceed even later. Summer and early autumn are the best times to sow.

Chinese cabbage should be kept growing continuously; efficient weed control and frequent irrigations are necessary.

(Continued on page 245.)

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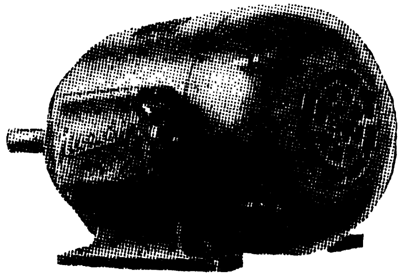

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AGRICULTURAL BUREAU CONFERENCE

At Woodstock.

PROBLEMS OF WHEAT AND SHEEP AREAS DISCUSSED.

A VERY successful conference of the Lachlan Division of the Agricultural Bureau was held at Woodstock, near Cowra, on 30th and 31st March. A programme of instructive addresses and demonstrations on subjects of interest to men and women in the wheat and sheep areas of the State was presented throughout the two days. In addition to technical farming and farm home subjects the programme included many items of general educational interest to rural people.

The conference was very well organised and managed, demonstrating the value of the Agricultural Bureau for the dissemination of agricultural knowledge. For this the Divisional Executive, Messrs, R. H. Oliver of Darby's Falls (President), and Wiley Johnstone of Waugoola (Hon. Secretary) were largely responsible.

The Official Opening.

Mr. J. Howse, M.H.R., who recently returned from a visit to Britain, officially opened the Conference. He said that the current situation—in which the world had a rising population and a decreasing food production—was a definite threat to peace. Australia, Canada and the United States of America were the only countries producing food in excess of their own requirements.

The Agricultural Bureau, by activities designed to find ways and means of increasing production, was answering the challenge of this situation. Only by the adoption of up-to-date methods could production be increased, and primary producers could best learn these methods by making contact with technical experts. It was one of the purposes of Agricultural Bureau Conferences to bring experts and producers together, so that production problems could be discussed.

Speaking particularly of the need to supply more foodstuffs to Britain, Mr. Howse said that the appalling situation existed that Britain, victorious in war, was being fed worse than any other nation. The diet of the people of Britain at present he said was monotonous to the extent that it was nauseating; particularly did they lack fats. He reminded delegates that we not only had a sentimental interest in the people of Britain, but also had a direct commercial interest, since Britain was our best customer, purchasing 80 per cent. of our export production.

The vote of thanks to Mr. Howse was proposed by Mr. J. R. Somers, State General President of the Agricultural Bureau.

Points from Addresses.

Mr. C. V. James, a well-known economist and an honorary member of the Agricultural Bureau, addressed Conference on "The Agricultural Revolution."

Industrial and agricultural revolutions had been in progress for more than two hundred years, he said, since two important inventions—the sewing machine and the flying shuttle—in the early part of the 18th century had commenced a period of great industrial development.

Great changes had followed these inventions—the family production unit was replaced by a factory system of production, with a consequent development of towns.

Mr. James discussed the influence of these developments on the activities of tillers of the soil under four headings.

(1) *Personal.*—The family position in human affairs was completely changed.

(2) *Political.*—Manhood suffrages which followed increased town population replaced government by landholders, and thus city people came to be in control.

(3) *Economic.*—Agriculture became less and less important economically, and this trend was still in evidence. In Australia before the 1914-18 war, about 60 per cent. of the national income was earned by primary producers, but in 1939 the figure was 50 per cent. and it was now less than half.

(4) *Technical.*—The state of affairs in which producers, prior to 1733, both made their tools as well as used them, had changed greatly, so that to-day, men who made farming tools no longer used them.

Sheep Diseases Common to the District.

Mr. John Henry, B.V.Sc., District Veterinary Officer stationed at Orange, discussed the common sheep diseases of the district.

Disease, he said, was tied up with nutrition, and as a preliminary to his talk he described the various types of food—proteins, carbo-hydrates, minerals and vitamins, and also indicated the importance of digestive values and the place of roughage.

Pregnancy toxaemia, he said was caused by a drop in the plane of nutrition and was overcome by supplying extra feed. Mineral imbalance or "lambing sickness," due to lack of calcium in the blood could be prevented by good management and the use of licks, and was easily treated by injection.

Some of the Women Delegates to the Lachlan Division Agricultural Bureau Conference at Woodstock.

Special sessions were held in C.W.A. Rooms.

Pulpy kidney, although caused by an organism, was brought about by nutritional conditions. To reduce its incidence, roughage should be supplied with lush green feed.

Climatic conditions determined the occurence of worms in sheep and nutritional conditions determined their effect on the sheep. Drenching should be timed in accordance with the weather and rotational grazing should be practised. Worm larvae only lived on pastures from three to four weeks, and drenched sheep should be put into spelled paddocks.

Declining Fertility of Wheat Soils.

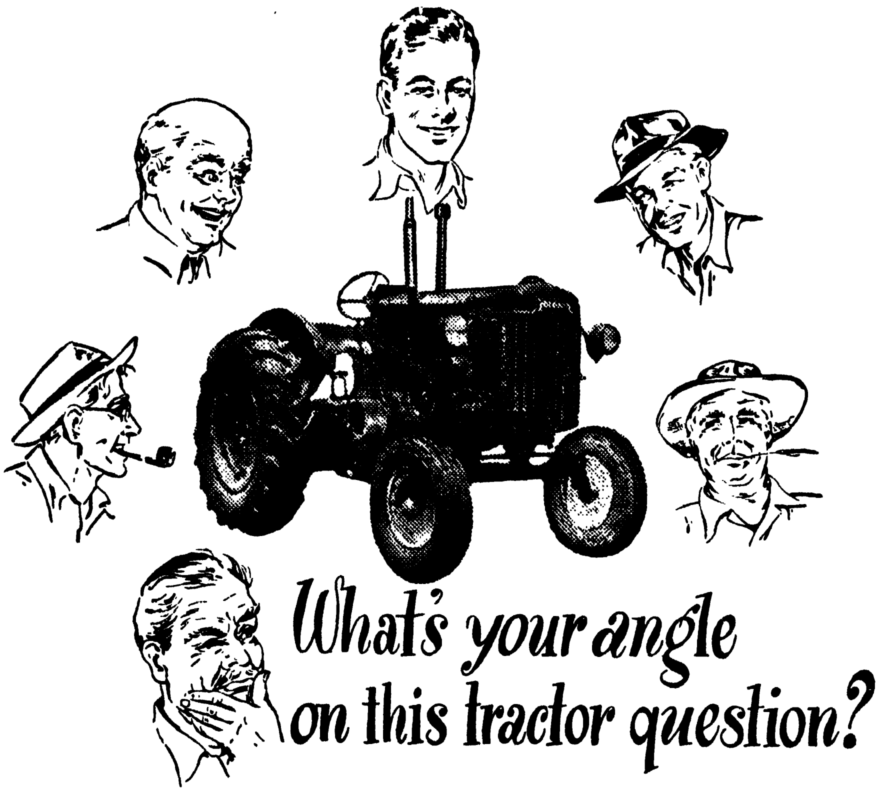
Mr. G. Nicholson, Cereal Specialist of the Department, whose subject was "Declining Fertility in the Wheat Soils," said that it might be asked, "Are our soils declining?" The recent high yields might perhaps be quoted as evidence that wheat soils have not lost their fertility. In reply to such a statement, he said that these yields were the result of exploitive methods of farming, good seasons, new varieties, and the use of fertilisers. The presence of weeds and the loss of soil structure were evidence of deterioration and the decreased protein content of the grain indicated a reduction in the nitrogen content of the soil.

The main problems of the wheatgrower appeared to be control of erosion and weeds the maintenance of soil fertility and increase of the productive capacity of his land. Fortunately, said Mr. Nicholson, we were passing from a stage of soil exploitation into one of a balanced agriculture of crops and stock. This trend towards a widening of activities—more pastures, more stock, more and better soil cover—was all important, since soil allowed to become out of condition was harder to rehabilitate than soil well cared for.

Special Women's Sessions.

On each day of the conference, special sessions were held for women. These were very well attended, as many as seventy women being present at times.

In addition the women attended those general sessions of interest to them.



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The sessions were held in the Country Women's Association rooms, kindly made available by that organisation.

Mrs. J. F. Rowlands proved an enthusiastic and efficient Hon. Secretary.

The progrmame included talks and demonstrations by: Miss Win. Wilson, Dietitian of the Department of Health (on "Ways of Using Milk and Cream"); by Miss Nancy Foskett (Extension Officer, Department of Agriculture), on "Planning Women's Programmes"; by Miss Noeline Taylor, Fruit Preserving Instructress, Department of Agriculture (on "Summer Fruit Drinks"); and by Mrs. H. C. Fitzhardinge of Mandurama (on "Points in Flower Judging").

Other Addresses.

Other interesting addresses on the programme were those given by Mr. E. S. Chambers on "Selling the Clip," in which he gave much useful information about the world wool situation, and by Dr. John Hughes, Deputy Director of the Tuberculosis Division of the Department of Public Health, in which he described the Anti-Tuberculosis Campaign now being conducted. Dr. Hughes dealt particularly with the work now being initiated with B.C.G. Vaccine.

Dr. A. W. J. Stocks, of Young addressed the Conference on recent trends in decentralisation of education; Mr. A. Meares of Forbes, one of the Rural Bank Progressive Farmer team which recently visited America and Britain, described his experiences; Mr. A. J. Murray of Cowra Ambulance, described the procedure to be adopted in farm homes in case of accidents; and Mrs. W. Johnstone of Woodstock gave an account of conditions in rural America, as seen during a recent trip.

State Wheat Committee Elected.

IN extending his congratulations to Messrs. O'Neill, Roberton, Doolin and Hoy, who secured election as the representatives of wheatgrowers on the State Wheat Committee, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said he would like to thank all growers who had accepted nomination to contest the poll. Mr. Graham said they had shown a keen sense of public duty in offering their services in the interests of the wheat industry.

"The Government nominees will be appointed very shortly after which I will convene the inaugural meeting of the State Wheat Committee," continued Mr. Graham. "One of the first tasks of the new Committee will be to nominate two wheatgrower members as the New South Wales representatives on the Australian Wheat Board."

Mr. Graham said he hoped the close liaison which would develop between the State Wheat Committee, the Department of Agriculture and the Australian Wheat Board in the future would be most beneficial to wheatgrowers. "In the past, there has been no liaison between this State and the Australian Wheat Board. This has been a serious handicap to all sections of the wheat industry," concluded the Minister.

Chinese Cabbage—*continued from page 242.*

Varieties.

Chinese cabbage should be harvested when the heads are firm and hard in the same way as cabbage.

There are two types of Chinese cabbage —a hard-heading type and a loose-heading type. The heading varieties such as Wong Bok, a short chunky type, and Pe-tsai, a taller variety which is larger at the top than the bottom, are recommended. Pak-Choi, a non-heading variety with dark-green smooth leaves, does not appear to be popular.

Pest Control.

As with all crucifers, pest control is important. The most serious pests are cabbage moth, cabbage butterfly and aphids. The two former can be dealt with by using a 2 per cent. DDT dust up to about a month before harvesting. For aphids a 2½ per cent. nicotine dust is recommended. If all three pests are troublesome a dust consisting of equal parts 2½ per cent. nicotine dust and 2 per cent. DDT may be used up to a month before harvesting.

"WHEATGROWERS who are experiencing delays in the delivery of superphosphate can obtain from the Commissioner for Road Transport special permits to use road transport for their requirements." This decision was recently announced by the Minister for Agriculture, Hon. E. H. Graham, M.L.A.

FRUITGROWING

TWENTY YEARS OF INVESTIGATION INTO ALMOND CULTURE.

C. H. MORT, H.D.A., Fruit Officer, Wagga Agricultural College and Experiment Station.

ORGANISATION, team work and perseverance are essentials to successful scientific investigation and research, particularly in the case of investigations concerning fruit-growing problems, because of the long-term nature of the crop.

In this article, the story of the main aspects of the almond investigation work conducted over the past twenty years by the New South Wales Department of Agriculture is related as an interesting example of how problems are approached and followed through by officers of the Department.

Although almond trees were grown in various parts of the State many years ago, the production of almonds on a commercial scale received very little attention in New South Wales until comparatively recently. In the late 1920's, for instance, most of the almonds produced came from trees planted around fences and on headlands in orchards producing mainly other types of fruit. Mostly, these trees received little attention, and crops were usually poor and negligible in relation to domestic market requirements. In most cases the nuts were of poor quality; faults such as weather-stained shells, pinched and malformed kernels and samples showing gumming due to fungous diseases were common.

It was then realised that opportunities existed for the commercial production of the crop, provided more systematic management techniques could be developed and problems concerning pollination and pest control could be solved; so investigations into the growing of the crop were commenced.

Variety Testing.

Consideration was first given to the collection and testing of varieties. Both scion wood for the propagation of trees and trees ready for planting were obtained of promising varieties from sources both within Australia and from overseas. These were planted in a variety trial block at

Almond Variety Trial Planted at Wagga Experiment Farm, 1930.

Wagga Experiment Farm in 1930. Additional varieties were later included in this collection and the block has been the primary variety testing ground and the foundation of almond investigation work.

From these trials an indication was obtained of the productiveness and quality of the various varieties and their general merits and faults were closely observed. From the collection, the more promising types were later selected for inclusion in a full scale randomised and replicated variety and stock trial established at Wagga Farm in 1939.

These two blocks of trees at Wagga, besides providing a wealth of information concerning varietal characteristics and performances, have made it possible to study the cultural requirements of the trees, to work out pest control programmes and generally to develop better management techniques. Experience in harvesting and handling the nuts has also been gained and consequently the Department now has a sound basis for instructional advice concerning the crop. These trees were also used for the comprehensive studies in almond pollination which are described in the next section of this article.

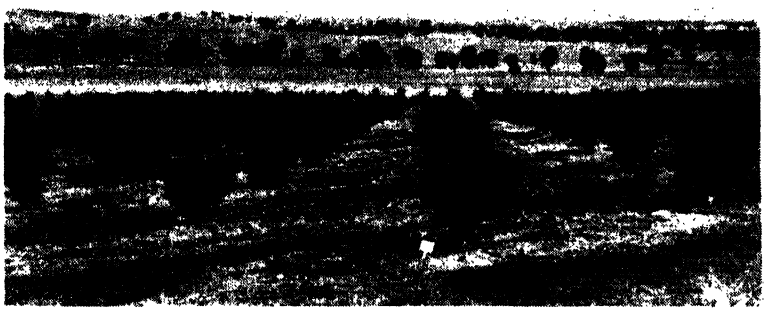
After the establishment of these trials at Wagga, attention was given to the planting of trials on growers' properties. Trees of the best varieties were propagated at the Department's nurseries at Leeton, Bathurst and Wagga, and with these trees, field trials were established in various portions of the State. During the next few years, these trials should give useful information concerning the behaviour of the main varieties under different conditions of soil and climate

Pollination Studies and Crossbred Trials.

The most interesting aspects of the investigations during the period, however, have been the pollination studies and the evolution of new crossbred varieties.

It had been known that many almond varieties were self-sterile and that cross pollination was necessary, but nothing was known of the suitability of varieties for crossing with one another and only very meagre information was available concerning blossoming dates and periods.

About the time the variety collection was being made at Wagga, officers* of the Fruit and Plant Breeding Branches of the Department working in association at Leeton, demonstrated that all known existing varieties were self-sterile, and commenced investigations to determine the degree of compatibility of pollen from various varieties for cross pollination purposes. These pollination studies were later continued at Wagga and intensified.



Testing Crossbred Almonds which Resulted from Pollination Work.
Planted 1944, photographed 1948.

However, as some varieties were known by different names in various localities and in other cases a single name was applied to more than one type of almond, adjustment and standardisation of the variety nomenclature was found to be necessary before pollination studies could be continued systematically. So, specimens of all almond varieties growing in Australia were collected; these were carefully sorted into different types and a detailed description of each

* Mr. W. Poggendorff, now Chief, Division of Plant Industry and Mr. J. D. Bryden, now Principal Fruit Officer (Stone Fruits).

variety was formulated. These variety descriptions were carefully compared with descriptions from other sources and the most universally accepted name for each variety was adopted.

Samples of varieties of American origin were also forwarded to an authority in California for identification and the names adopted here for these varieties were verified as being the same as those by which the same varieties are most commonly known in America.

The names adopted for varieties of Australian origin were also verified as being the same as those used in South Australia —the most important almond-producing State of the Commonwealth.

The blossoming dates and periods of the various varieties and the extent to which these overlapped had then to be determined. So, during the spring for a number of years, the percentage of blossom open on each variety under trial was estimated every two days and these estimates were recorded and graphed. From a comparison of the graphs of any two varieties it can be seen whether the blossoming dates synchronise sufficiently for cross pollination purposes.

The type of graph obtained is shown in the figure on page 249, which indicates the blossoming periods of the main varieties.

However, varieties that blossom during the same period are not necessarily suitable for cross pollinating one another, and this was demonstrated to be true with almonds during the early stages of the pollination studies.

A comprehensive cross pollination programme was therefore initiated to test the pollen compatibility of all the best varieties. This necessitated the controlled crossing and back-crossing by hand of all varieties used. During these studies, which continued over a period of eight years, over eighty thousand blossoms were carefully covered with bags while in the balloon stage; and later hand pollinated by the use of a camel hair brush, with pollen from other varieties. After being pollinated they were re-covered until the stigmas were no longer receptive; and later the number of almonds set from each cross was recorded and results compared with results from open pollination.

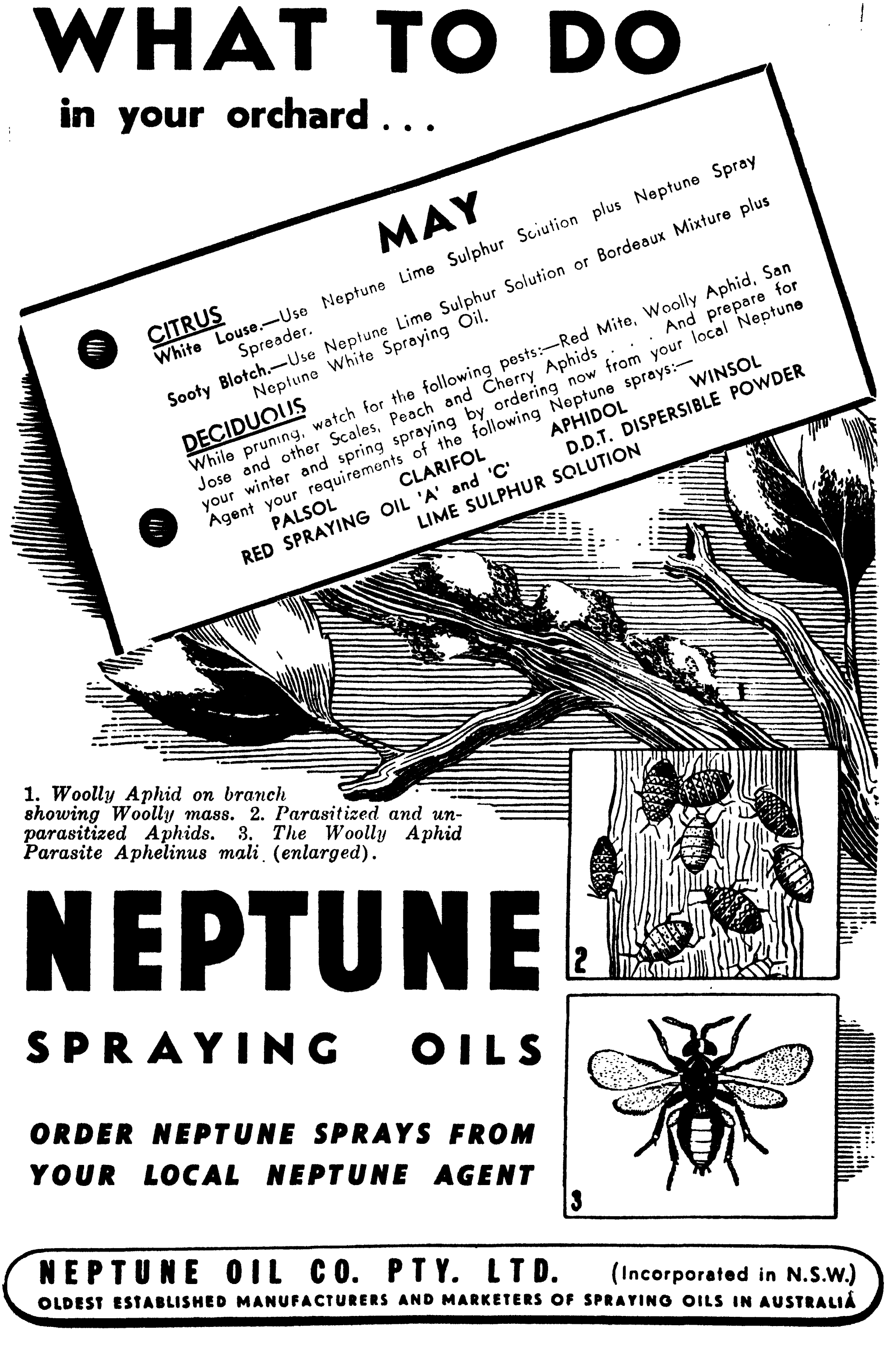
These studies established the degree of pollen compatibility of the varieties used and indicated suitable variety combinations for planting.

Testing Crossbred Seedlings.

During the pollination studies, almonds were obtained which were the result of controlled crosses between two known varieties, and it was felt that by growing these, better varieties than existing types might be produced. In particular, a good almond suitable for pollinating Hatch's Nonpareil was required because, from many points of view, Hatch's Nonpareil is the best variety grown in Australia, while varieties suitable for pollinating Hatch's are not entirely satisfactory commercially.

Pollination Studies.
Blossom clusters covered to prevent natural pollination.

The nuts obtained as a result of this cross-pollination work were, therefore, collected and planted at Leeton Experiment Farm where approximately two thousand seedlings were raised and tested. The blossoming period of each of these seedlings was noted and those bearing the best type of nuts were selected for further trial.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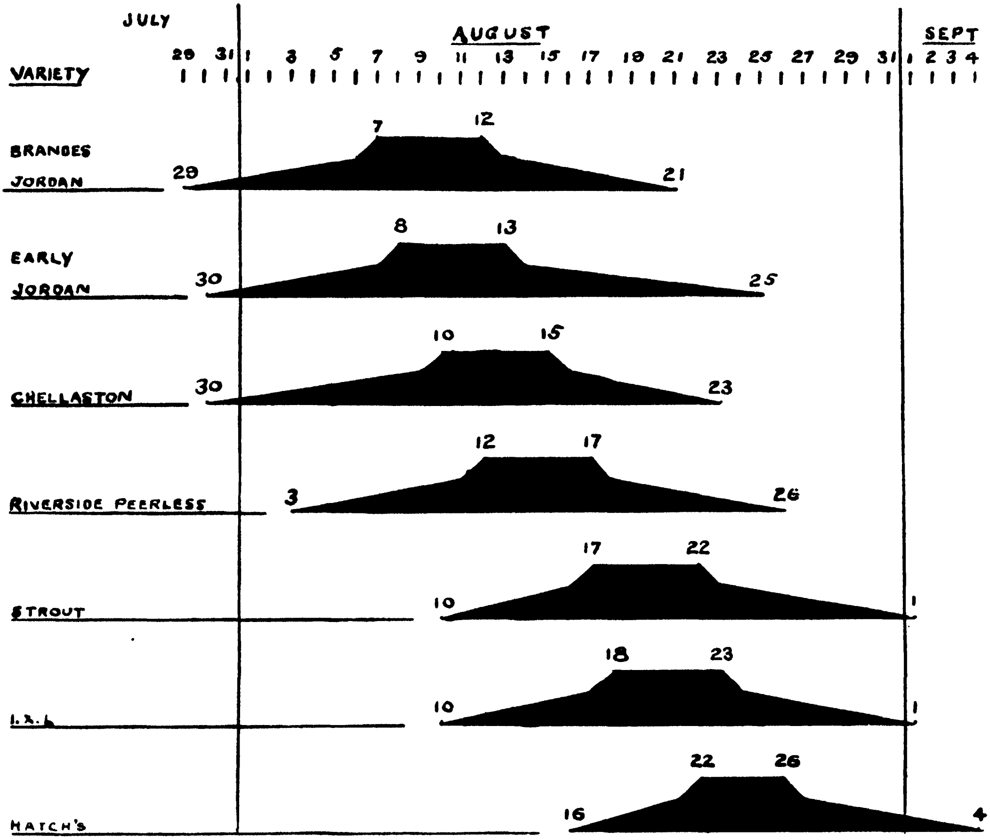
The selection extended over a period of three years during which time the nuts on the trees were carefully examined and any promising types noted. Those which showed promise were then compared with existing varieties and what appeared to be the best fifteen of these were finally selected for inclusion in a crossbred variety trial at Wagga.



Almond Blossoming Range, Wagga Experiment Farm.

Showing first blossom, beginning of full bloom, end of full bloom, and last blossom. Average for six years, 1936-41.

Crossbred Variety Trial.

Trees of the fifteen selected crossbreds and trees of a number of standard varieties were then propagated on a uniform type of stock and a crossbred variety trial was planted at the Wagga Farm in 1944.

In this trial, plots containing eight trees of each of the selected crossbreds are interplanted with standard varieties for comparison, and from these, definite information concerning their commercial value will be obtained.

The trees have made good growth and carried small crops of nuts during the past three seasons. Last spring, pollination studies were commenced to determine the value of these crossbreds as pollinators for one another and for the standard varieties.

While it is yet too early to determine the value of these selections they are very promising and there appears to be definite possibilities of obtaining some better commercial varieties and also of finding a good pollinator for Hatch's Nonpareil.

Information Published.

Information obtained from the various investigations has, at all times been given prompt publicity. In 1938, articles dealing with "Handling the Almond Crop,"[1] "Planting Almonds"[2] and "Pruning the Mature Almond Tree"[3] were published in the *Agricultural Gazette* and in 1939 a comprehensive article on "Almond Culture"[4] appeared in the same paper. These articles contained recom-

mendations based on information gained from the various studies and investigations which had been conducted. The article on "Almond Culture" was later reprinted as a pamphlet, of which an up-to-date edition is available free on application to the Department.

Brandis Jordan Almond at Wagga Agricultural College and Experiment Station.
Planted 1939, photographed 1948.

A further article on "Almond Pruning" was published in the *Gazette* in 1945[5] and various articles dealing with pests and diseases of the almond contributed by the Entomological and Biological branches of the Department have been published from time to time.

A progress report is now being prepared for publication on the replicated variety and stock trial being conducted at Wagga Wagga, and results from the crossbred trials will be published as soon as reliable data is available.

Conclusion.

Although these investigations concerning almond culture have occupied a considerable period they have been continued in a logical sequence and a solid foundation has been formed on which investigations into other aspects of almond production can be continued.

The information gained has also been of direct value in assisting the industry and has formed a sound basis for instructional advice by departmental officers.

The story of these investigations, however, is but one example of the work that the Department is conducting for the benefit of every branch of the agricultural, pastoral and horticultural industries of the State.

References.

[1] Handling the Almond Crop, by J. D. Bryden *Agr. Gazette* 49, page 212.

[2] Planting Almonds, by J. D. Bryden, *Agr. Gazette* 49, page 212.

[3] Pruning the Mature Almond Tree, by J. D. Bryden, *Agr. Gazette* 49, page 264.

IXL Almond at Wagga.

[4] Almond Culture, by J. D. Bryden, *Agr. Gazette* 50, page 252.

[5] Pruning the Almond, by K. D. McGillivray, *Agr. Gazette* 55, page 205.

Inspection of Bananas at Rail-heads.

THE Banana Growers' Federation has decided to introduce rail-head inspection of bananas in order to improve grading and packing of the fruit and to prevent poor quality bananas reaching the markets.

These inspections will be made by the Society's representatives, and will embrace all consignments to southern markets.

It is considered that such inspections can improve considerably the standard of the product offered for public consumption.—HORTICULTURE DIVISION.

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PLANT DISEASES

Notes contributed by the Biological Branch

Division of Science Services

STERILIZATION OF SOILS IN GLASSHOUSES.

THE use of the same piece of ground, in successive years, for the growth of any one species of annual crop is well recognised as being bad agricultural practice, and should be avoided as far as possible. However, the expense and labour involved in dismantling and re-erecting glasshouses, coupled with the limited amount of ground available in suitable locations, has forced growers of early tomatoes to use the one piece of ground for three or more years, and sometimes to revert to tomato "sick" land in a rotation period too short to be of much practical value.

The main factor responsible for "sick" ground is the build-up, in the soil, of species of micro-organisms pathogenic to the particular species of plant to be grown. Thus, in this State, tomato growers are worried chiefly by the fungi *Fusarium* and *Verticillium* and by the eelworm *Heterodera marioni*, all of which enter the roots from the soil and cause the plants to become unthrifty and, often, to wilt and die.

If the soil can be kept reasonably free of the above pathogens, successful crops can be grown for several successive years without there being any necessity to remove the glasshouse to a new site.

Methods of Soil Sterilization.

There are several ways in which the soil may be treated to destroy soil-borne pathogens, though each of these has advantages and disadvantages.

Steam Sterilization.

If effectively practised, steam sterilization will rid the soil of eelworms, fungi, insects and weed seeds.

The spike harrow process is favoured by tomato glass-house growers in the Sydney Metropolitan Area. Other methods of steaming soil which are used overseas, but which are not widely used in this country, include the buried perforated pipe system and the buried drain tile system. In all cases steam is supplied from a boiler which should preferably be of the movable type, and of sufficient capacity to supply the required quantity of steam for the size of outfit used.

The Spike-Harrow System.—As shown in the accompanying figure the tines are attached to the lower surface of a combined inverted pan and steam chamber. The type most commonly used here consists of a pan 3 feet 9 inches by 2 feet 9 inches, made from 12-gauge galvanised iron, reinforced on top and bottom. The steam chamber is 2¼ inches deep and the tines, 12 inches long and ⅜ inch in diameter, are arranged in seven rows of five tines. Each tine is pointed and perforated with four $\frac{3}{32}$ inch

holes near the point. In addition to a steam inlet in the centre of the top, there is a plate which acts as a stream spreader inside the pan, and a 6-inch diameter plate in one of the corners on the top surface so that the interior of the pan can be cleaned out periodically. Iron brackets are usually placed on each corner so that the apparatus can be attached to timber for carriage.

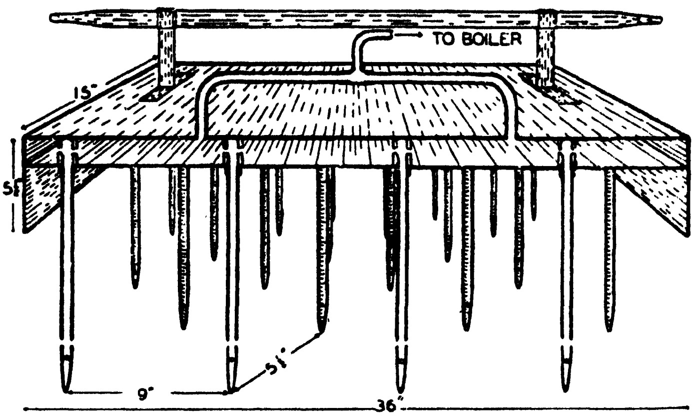
Spike harrows are operated in pairs. Steam is first turned on, and the tines firmly pressed into the soil until the tip of the pan is buried. Each spike harrow is allowed to remain until the required temperature (180 deg. Fahr.) is secured at the necessary depth, and with steam still flowing, is withdrawn and inserted in the next section. By retaining the flow of steam, blockage of the holes in the tines is prevented, entry into the soil facilitated and condensation of steam avoided.

Formalin.

Formalin is chiefly a fungicide and is of very little value in destroying eelworms, insects or weed seeds in soil.

One part of commercial formalin is diluted with fifty parts of water to make a sterilizing solution. The soil is then loosened with a fork, and the mixture applied to it at the rate of ½ to 1½ gallons to the square foot, the amount depending on the quantity necessary to saturate the soil.

The soil is then covered for 12 hours with bagging, after which the covers are removed and the soil stirred several times during the next two weeks to allow the fumes to escape before planting. This period of two weeks may be shortened slightly by more frequent stirring of the soil.



Spike Harrow for Steam Sterilization.
Drawing by G. G. Taylor.

After withdrawal of the harrow, the soil is preferably covered with a tarpaulin or sacking for half an hour.

Disinfection is secured to a depth of 10 to 12 inches in from 7 to 10 minutes with a boiler pressure of 75 to 100 lb. Soil should be well worked and of a moderate moisture content before steaming.

Some difficulty is experienced in locating steam generators of suitable design and capacity for the steam sterilization of glasshouse soils. At present, a second-hand boiler is the only possible purchase, and these are very difficult to locate. However, it is understood that an engineering firm is endeavouring to design a suitable unit, which will be inspected by this Department immediately it is produced.

Chloropicrin.

This substance gives good control of fungi, bacteria and nematodes. Holes are made 5 to 6 inches deep and 10 inches apart and ½ to ¾ teaspoonful of the fluid is poured into each hole, and the soil tamped down. The surface soil should be moistened and covered with moist bags for several days. The soil should then be turned over and aerated, and left for a week or more, before planting.

Chloropicrin is a liquid which gives rise to an irritant gas, and precautions have to be taken to avoid discomfort when applying it to the soil. The glasshouse should be opened up as much as possible and the wind should be in a direction which will blow the fumes away from the worker. Like

D.D., this fumigant is best applied by mechanical means.

D.D.

D.D. is effective in controlling eelworms, though it has little value as a fungicide or for the destruction of weed seeds and insects.

Injection holes should be 6 inches deep, and should be 12 inches apart.

Though it is irritant to mucous membranes and also to the skin, if allowed to remain in contact for too long, it is less unpleasant than chloropicrin to handle; it is also less expensive.

Other Soil Fumigants.

Other chemicals are used for soil sterilization. Some of them have been superseded by newer types and yet others are still not available on local markets.

Preparation of Soil for Fumigation.

The seed-bed should be prepared as for planting. There should be no clods, lumps or undecomposed plant material present and the whole should be moderately loose. If manure or compost is to be added this should be done prior to fumigation. Best results are obtained when the seed-bed is fairly moist.

The fumigants are applied through holes made in the soil. If mechanical injectors are not available, the holes can be made, to a depth of six inches, with a pointed stick. To facilitate better coverage of the whole area treated, the holes should be "staggered" (see accompanying figure).

After treatment, the holes should be plugged and the soil made as flat and smooth as possible. Small areas can be smoothed over with a hand-rake. For moist soils, rolling is beneficial. After application of chloropicrin, the area should immediately be sprinkled with water to give a "water-seal" In the case of "D.D." a water-seal should not be necessary in a moist seed-bed.

Cost of Treatment.

No accurate figures are available for the cost of sterilizing soil by steaming, but growers estimate that an outlay of £9 to £10 per glasshouse (95 feet x 15 feet) will cover all expenses, including labour. Treatment with chloropicrin, which costs between £6 and £6 10s. per gallon, incurs an outlay of approximately £8 per glasshouse, while D.D. at £1 1s. per gallon would cost about £1 per glasshouse. The estimates for chloropicrin and D.D. do not include labour charges.

Selection of Method of Sterilization.

Steam sterilization, because of its many beneficial effects, is probably the most effective method in light and sandy soils. However, many growers have ceased to use steam when they are farming on clay soils. In this type of soil, heat penetration is very slow, and the cost of treatment is correspondingly increased. In heavy soils formalin is commonly used and is satisfactory because eelworms are rarely a trouble under these conditions. The cost of this treatment is high, being about £18 per glasshouse.

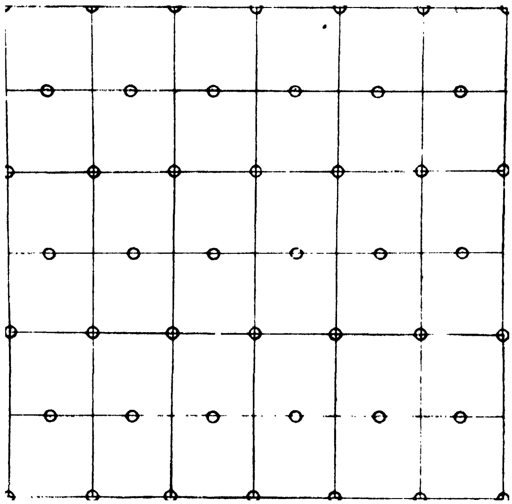


Diagram Illustrating "Staggered" Arrangements of Injection Holes.

D.D., though least expensive, is probably also least satisfactory for tomato glasshouses, as fusarium and verticillium wilts are perhaps a greater menace than eelworms.

Chloropicrin has shown some promise in sandy soils and, if steam is not available, is recommended. As this chemical must diffuse through the soil to be effective, it canot be suggested for use in the Wianamatta shale soils around the Parramatta district at this stage. Further observations will have to be made before any definite opinion can be expressed.

SCLEROTINIA ROT OF PLANTS.

DURING the cooler months of the year considerable damage occurs in agricultural plants as a result of attack by the fungus *Sclerotinia scleriotiorum.* **The extent of the damage is closely correlated with weather conditions, the heaviest losses occurring when cool, moist periods are experienced.**

Unlike most parasites which attack only one or two hosts *Sclerotinia* **has been recorded on citrus, passion fruit, sunflower, cotton, cabbage, cauliflower, lettuce, peas, beans, tomato, potato plants (not tubers), parsnip, carrot, turnip, parsley, celery, cucumber, sweet potato, spinach, rhubarb, peanut, vetch, clovers, grasses and other plants, including a number of herbaceous weeds.**

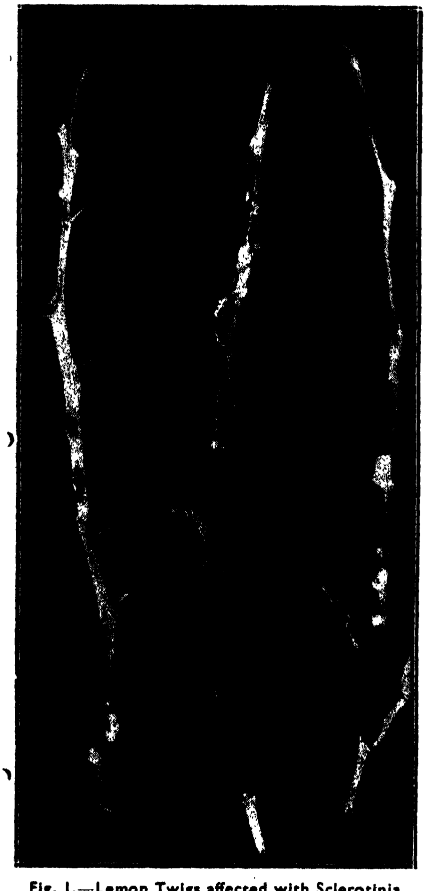


Fig. 1.—Lemon Twigs affected with Sclerotinia Rot.

Note the white fungous outgrowths and the black sclerotia or resting bodies.

Sclerotinia Disease of Citrus.—The fungus attacks all types of citrus, but is usually most severe on lemons. Under local conditions it is usually on the twigs that the disease first appears. The leaves on affected twigs wilt suddenly, lose their natural colour and die, but mostly remain attached to the shoot for some time. The bark develops a pale ashen colour, softens and finally becomes somewhat fibrous. Extensive gumming may occur on the lower portions of the affected twigs.

Attack by the fungus is not confined to twigs; large limbs may be girdled and killed, and the bark of the trunk is sometimes attacked at ground level giving rise to a typical collar-rot accompanied by gumming. Spraying has not proved to be a satisfactory method of control; however, the pruning and burning of affected twigs has been shown to be useful, as it not only removes

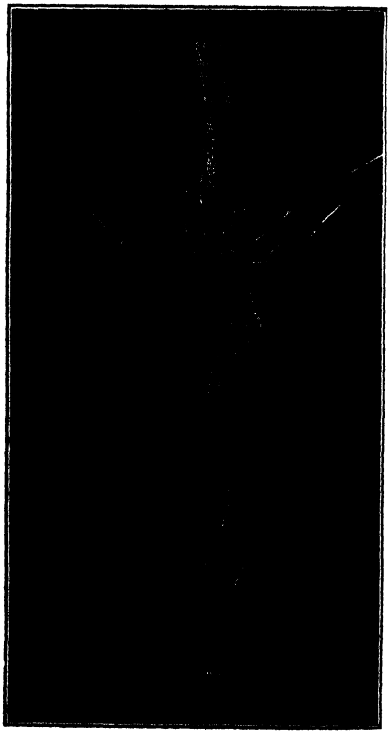


Fig. 2.—Passion Fruit Cane affected with Sclerotinia, opened to show Resting Bodies of the Sclerotinia Fungus.

the fungus and dead wood but minimises the risk of re-infection in succeeding seasons.

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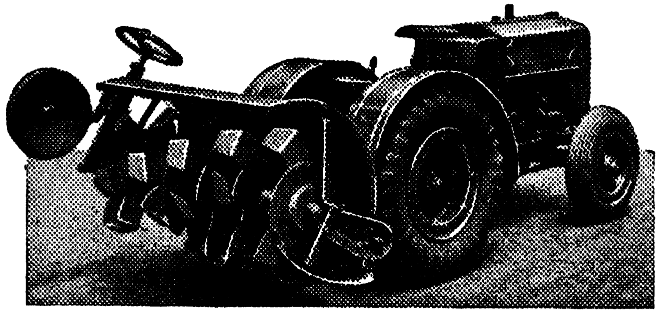

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In infested orchards it is desirable to eradicate weeds which may act as alternative hosts and breed out spores of the fungus.

Fig. 3.—Sclerotinia Rot of Beans. "Nesting," is the term applied when beans become affected in storage or transit. One or two beans infected in the field, and included in a bag or case can result in the breakdown of many beans surrounding them. Bags of carrots and parsnips may be affected in the same manner.

Sclerotinia Disease of Passion Fruit.—Passion fruit may be seriously affected by *Sclerotinia*, laterals or whole plants being destroyed, depending on the point of infection. In this case, the hard dark resting bodies which later give rise to spores are often found within the hollow stem.

Affected laterals and drying plants should be removed and burnt. However, if infection at ground level is only slight, the plant may sometimes be saved by scraping the soil from the base of the plant, cutting out the diseased areas and painting the exposed surface with Bordeaux paste (bluestone 1½ lb., hydrated lime 1½ lb. and water 2 gallons).

Fig. 4.—A Parsnip affected with Sclerotinia Rot. The upper portion of the root is covered with black, irregularly-shaped sclerotia which are developing from the white mat of the fungus. At this stage the root has commenced to shrivel.

Sclerotinia rot of Vegetables and other Plants.—The disease develops in most vegetables in the form of a watery soft breakdown, and is known to growers by a variety of names, such as "mildew," "watery rot," "soft rot," "sclerotinia rot," etc. As in the previous instances, the development of the disease in its early stages is favoured by cool moist conditions in winter and spring, particularly on the heavier soil types. The plants are attacked in the field, but by far the greatest amount of loss occurs after the crop has been harvested and during transit to market. If there is delay in processing or transport, during spring months, of vegetables such as carrots and parsnips, considerable losses with certain consignments will be inevitable. Consignments from certain farms are usually more prone to loss than those from others.

Following upon the breakdown in the vegetable concerned, dense white tufts of the fungus develop. This fungal growth is eventually transformed into irregularly-shaped hard black bodies—the resting stage of the fungus (sclerotia). It is the build-up in concentration of these resting bodies

in cultivated land which constitutes a serious problem for the vegetable grower, particularly if susceptible crops are grown year after year in the same land.

Fig. 5.—Sclerotia of the Sclerotinia Fungus.

Showing the "sprouts" or shoots to which they give rise under suitable conditions. The trumpet shaped end of the sprout bears the spores by which this disease is spread.

Control Measures.

Soil disinfection appears to be the only method of effectively controlling this trouble on contaminated vegetable land, and even then, the benefits may not be of a lasting nature. For Australian conditions soil sterilization with heat or chemicals is recommended only for very small areas of valuable crops.

Field sanitation, the destruction of diseased plants and the use of a two- or three-year crop rotation system will, however, do much to minimise losses from this source. The same crop should not be planted year after year on the same land. It is advisable also that vegetables be not harvested during rainy periods in the cooler months, as this usually results in heavy losses in transit and at the market centres. Fungicidal dipping experiments conducted with beans shipped from distant production centres have failed to give any control.

Growers should, as far as possible, use land free from this disease, and if affected plants are noticed in otherwise clean land, they should be removed and burned to prevent the sclerotia returning to the soil. Where the land does become heavily contaminated with the disease it is advisable to use the land only for crops which are grown in the warmer and drier months of the year.

Short Refresher Courses in Principles of Farm Management.

For Ex-Servicemen.

FURTHER courses in the Principles of Farm Management, of eight weeks' duration have been arranged for ex-servicemen by the Department of Agriculture, and will be held at the Department's Experiment Farm, Yanco, commencing on the following dates:—

Number 11 Course—18th July to 9th September.

Number 12 Course—19th September to 11th November.

Application to attend should be made to the Deputy Co-ordinator at the Department's address.

It is not the intention of these Courses to give instruction to the beginner, but to provide the experienced farmer or grazier with information as to the latest developments, research and scientific methods that have become accepted during the time he was serving with the armed forces.

The opportunity is taken also to provide instruction in Elementary Agricultural Economics and Farm Management, together with refresher lectures and demonstrations on many agricultural and veterinary subjects and practices. Arrangements have been made for special instruction in Wool Classing.

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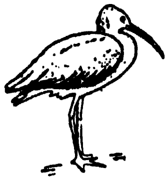

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Agricultural Societies' Shows.

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albury Sheep Show (A. G. Young)	July 19, 20, 21
Condobolin	August 9, 10
Trundle	August 16, 17
Bedgerabong	August 20
Peak Hill	August 26, 27
Wagga Wagga (G. O. Dewey)	August 23, 24, 25
Parkes	August 29, 30, 31
Grenfell	September 2, 3
Young (T. A. Tester)	September 6, 7
Forbes	September 9, 10
Cowra	September 13, 14
The Rock (O. L. Boyd and A. F. Walker)	September 17
Canowindra	September 20, 21
Eugowra	September 27, 28
Albury (A. G. Young)	October 11, 12, 13

1950.

Newcastle (P. G. Legoe)	February 22, 23, 24, 28

Approved Vegetable Seed May, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear that number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney .

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—*continued.*

Cauliflower—

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why Parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Hunter River Brown (R.M. 47/12 and R.M. 48/4)—R. C. Morandini, Box 74, P.O., Dubbo.

Crystal Grano (R.M. 48/6)—R. C. Morandini, Box 74, P.O., Dubbo.

Early Barletta (R.M. 48/7)—R. C. Morandini, Box 74, P.O., Dubbo.

Tomato—

Pearson (Moscow) (H.R. 47/6 and H.R. 48/1) —H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 47/2)—H. P. Richards, "Sovereignton," Tenterfield.

THE "Agricultural Gazette" is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.

INSECT PESTS.

Notes contributed by the Entomological branch.

INSECT PESTS OF MAIZE.

MAIZE is subject to insect attack at all stages of growth, the most important pests being cutworms, the corn ear-worm or Heliothis caterpillar, the black beetle and the yellow maize moth. Other insects which at times cause serious damage are the Monolepta beetle, the pink corn-worm and army worms. Other insects that may attack maize include wireworms, which feed on the roots or freshly-sown seed, white curl grubs which also feed upon the roots, grasshoppers and aphids—but these pests do slight damage only.

The common grain weevil and the common grain moth are the most important pests of stored maize.

Cutworms (*Noctuidae*).

Cutworms are grey to black caterpillars which feed at night and hide in the soil during the day; they eat the stems of young maize plants at ground level. Cutworm moths lay their eggs in grass and weeds, and, to prevent land from being infested at sowing time, plough in the autumn or early winter, and harrow at intervals to destroy weeds.

Cutworms may be controlled in maize by distributing poison bait (*see* army worm) along the rows, or by dusting with 5 per cent. DDT powder at the rate of 15-20 lb. per acre.

The Army Worm (*Cirphis unipuncta*).

Infestation generally occurs in the late summer or early autumn, and in seasons when grass and weeds are abundant. These caterpillars may invade crops that are well advanced in growth, climbing the plants to feed upon the leaves and developing tassels.

Army worms may be destroyed by dusting or spraying with DDT or by using poison bran bait.

In treating with DDT, 15-20 lb. of 5 per cent. powder or 100 gallons of 0.2 per cent. spray, generally, will be required per acre. Baits may be prepared by mixing 1 lb. of 20 per cent. BHC powder, or 1 lb. of Paris green, with 24 lb. of bran, and making it into a mash with 2½ gallons of water.

Baiting is effective in weed-free crops, but the caterpillars, generally, have to be dislodged from the plants by shaking or jarring. In weed-infested crops, dusting with 5 per cent. DDT is preferred. When fodder which has been treated with DDT is fed to dairy cattle, the milk may become impregnated with DDT, and maize should not be treated with DDT if it is intended to feed it to milking cows.

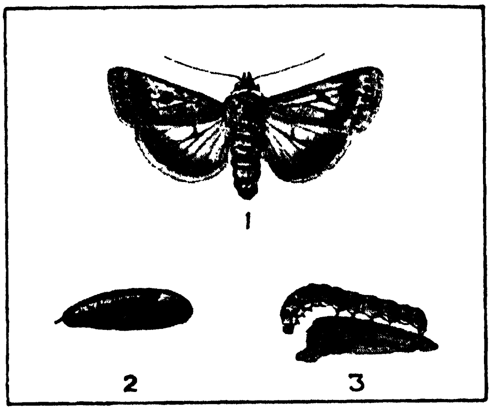
To check the progress of army worms a deep furrow may be ploughed with the vertical side nearer the crop. Caterpillars accumulating in the furrow may be destroyed mechanically or by baiting.

The Corn Ear-Worm or Heliothis Caterpillar (*Heliothis armigera*).

These buff-coloured or reddish-brown moths lay their eggs on the maize silks. The caterpillars that hatch from these eggs feed upon the silk and later attack and destroy the tip of the cob. Injury to the tip permits the entrance of moisture and moulds which further damage the cob.

In seasons of good summer rainfall, inspect the crop at early silking. If moths and eggs are abundant, dust with a 5 per cent. DDT powder at the rate of 15-20 lb. per acre. For valuable seed crops, treating the individual ears with DDT powder, or with a few drops of white mineral oil (viscosity 200-250) is suggested. The silks of each ear should be treated about five days after they appear.

Areas that have been cropped with maize and sweet corn should be ploughed and harrowed during the following winter to destroy overwintering pupae in the soil.



1.—Adult of Heliothis Caterpillar.
2.—Pupa. 3.—Caterpillar.

The Black Beetle (*Heteronychus sanctae-helenae*).

The black beetle is a pest in coastal districts. It breeds in grazing lands, and ideal conditions for its development are provided where the soil is covered with mat-forming grasses, such as paspalum, carpet grass and buffalo.

This glossy-black beetle, which measures about ½ inch in length, has the front legs modified for burrowing into the ground. It attacks a wide variety of plants; in maize, it eats the stem at ground level or slightly below, causing the plants to wilt or die.

The eggs are laid in the ground, and there the larvae, which are white curl grubs, eventually transform into the pupal or chrysalis stage. Early in the year they emerge as adult beetles. The beetles cause some damage to autumn crops and then become inactive in the soil during the winter. With the return of warm weather in the spring they become active again and may severely damage maize, and other crops, from September to the end of November. By the end of November the beetles cease their attack on crops and die out. There is then a damage-free period until the next generation of beetles commences to emerge in January or February.

CONTROL.

Cultural Operations.—Black beetles, usually, are abundant in freshly broken up paspalum land, but over a period of twelve months such soils may be freed of the pest, and made suitable for maize, by cultivating to destroy weeds and grasses, and by growing crops such as cowpeas, peas, beans, and sunflowers, which are distasteful to the beetle.

Poison Bait.—A poison bait may be prepared by mixing 3 lb. of 10 per cent. BHC powder with 1 cwt. of broken maize. Land intended for maize should be baited as soon as the beetles become active with the warm weather of spring. The aim of this spring baiting is to rid the land of beetles before sowing, and the bait should be broadcast at the rate of ½ bushel per acre. In order to have the bait in the soil as well as on the surface, an area may be baited, harrowed or disced, and then baited again.

Barriers.—The migration of beetles crawling in from adjacent grassland—an important source of crop loss—can be prevented by the well-known practice of running a vertical-sided furrow between the cultivation area and the nearest grassed land. The furrow should be deep and its steep side should be nearest to the crop. If the furrow is likely to flood or crumble, some bait should be scattered along its length.

The Black Beetle.
Enlarged about four times.

Destruction of crops by flying swarms is considered to be rare, at least in areas south of the Clarence River.

Jetting with DDT—Where poison bait is used *after the crop has been planted* many

beetles will be killed, but, despite this reduction in beetle numbers, some degree of crop loss can be expected.

More effective protection of the growing crop may be obtained by jetting the soil around each plant with 0.1 per cent. DDT emulsion. One gallon of mixture is sufficient for 1½-2 chains of a row, and 150-200 gallons are required per acre.

The Yellow Maize Moth (*Dichocrocis punctiferalis*).

The caterpillars are pale buff- to slaty-coloured, and are marked with small brown spots. They bore into the stalk and cob shanks, destroying the conducting tissue. They also bore through the length of the cob, eating and destroying the core and the grains themselves. The caterpillars pupate in the tunnels, which usually are silk-lined. The dark brown pupae are elongate and narrow, and the moths that emerge from these are orange, marked with small black dots.

Control.—No specific control measures have been worked out for this pest, but it is suggested that treatment with a 5 per cent. DDT at the rate of 15-20 lb. per acre might prove of value.

The Yellow Monolepta Beetle (*Monolepta rosea*).

This native species of beetle, which occurs in north coast districts, damages the silks and tassels of maize. In addition, the beetles attack a wide range of vegetables, flowers and fruit.

The beetles, which are about ¼ inch long, are of a general orange-yellow colour. The base of the wingcovers and a small spot in the middle of each cover are bright cerise.

For control, dust or spray with DDT. Their habit of swarming in thousands on individual fruit trees, pepper trees or wattles, sometimes enables great numbers of these beetles to be killed before they migrate to maize or other crops.

The Pink Corn-Worm (*Batrachedra rileyi*).

These caterpillars damage maize by eating out the grain and feeding on the core, husk and silk of the cob. They attack the ears in the field and in the barn, but damage is not serious in shelled and bagged grain. This caterpillar also feeds on sugarcane, banana, lantana and sorghum.

The caterpillar, which may measure up to ⅜ inch in length, is pink. The small brown pupae may be found in silken cocoons either in the husks or silks, or among the grains.

The adult moth, which is smaller than the common grain moth, is light greyish-brown, slender and inconspicuous. The minute, pearly-white eggs are laid on the cobs.

Prompt husking and shelling of the ripe cobs will minimise losses from this pest.

PESTS OF STORED MAIZE.

Storage pests of maize are mainly troublesome in north coast districts of New South Wales. The most serious damage is due to grain weevils, but grain moths also cause loss.

The Common Grain Weevil (*Calandra oryzae*).

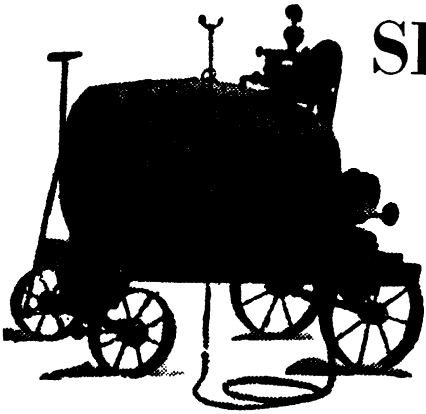
On the north coast of this State, weevils which over-winter in sheds and barns fly out to infest the earliest sown crops, which mature, and are fit for use, by December or January. Field infestation commences while the grain is in the dough stage and two generations of weevils may develop before the grain is mature. These weevils lay their eggs on ears that have a poor or damaged husk-covering. Ears that are well covered with tight-fitting husks usually escape infestation.

Crops ripening their grain in warm weather, when weevil development is at its height, require to be harvested quickly to avoid losses due to field infestations. As these cobs may be soft they should be husked to facilitate curing and drying. It is not desirable to store this early maize as its moisture content will be high, and while the grain is drying out the weevils may cause serious damage.

The adult weevil, which measures about 3/16 inch in length, is dull brown in colour, and its wingcovers are marked with four reddish spots. Its head is produced forward to form a proboscis or snout.

The female punctures the grain with its proboscis and lays an egg in the cavity. The larva develops and, when fully-fed, enters its pupal or chrysalis stage within the grain. Later, the adult develops from the pupa, and soon gnaws its way out, leaving a small exit hole in the grain. Upon emerging the weevils mate and the females proceed to

The SPRAYMASTER



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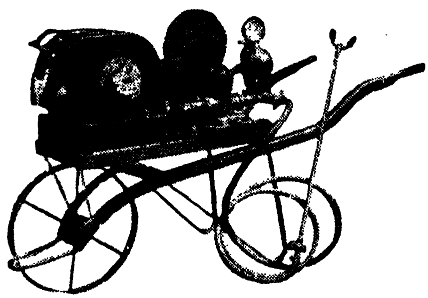

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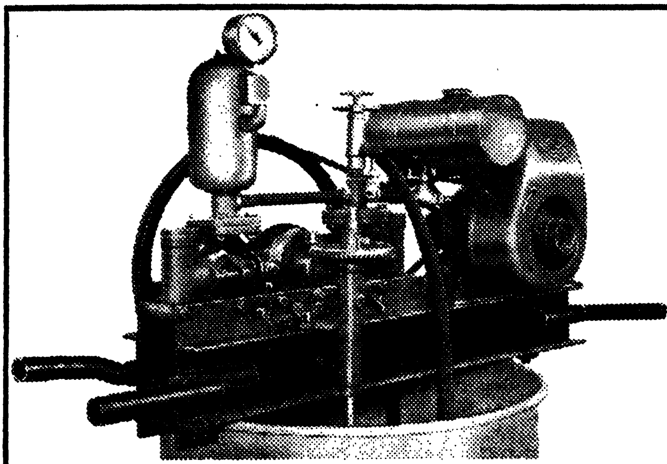

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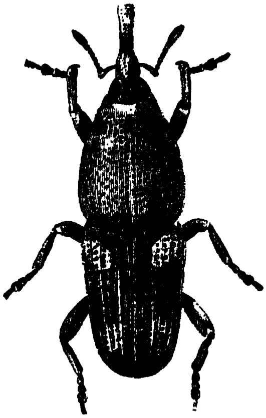
re-infest the grain. As an individual female may lay 200 or more eggs, a heavy infestation may develop rapidly.

During warm, moist weather the life-cycle from egg to adult may occupy a month, but each stage of development may be prolonged into several months under unfavourable conditions.



The Common Grain Weevil.

Storage of Shelled Grain.

Maize crops sown in December-January on the north coast mature in the cool weather of July and August, and are thus comparatively free from weevils in the field at harvesting. They remain so until September or October, and from then onwards weevils develop rapidly and cause great loss if the grain is held through the summer without protection.

The best method of storing shelled maize is in galvanised iron tanks, but the moisture content of the grain must be sufficiently low (14 per cent.) to prevent heating or mould.

Grain which appears quite sound may carry eggs or larvae, and infestation will almost certainly develop during storage unless control measures are adopted.

Weevils are unable to live if totally deprived of oxygen, and grain will remain undamaged, if stored in an airtight tank or silo from which oxygen has been excluded.

The two main methods of displacing oxygen in the container are:—

1. The container is completely filled with grain to the extent of ramming it, so that no space in the container remains unoccupied. The vital processes going on in the grain use up the oxygen in the container, producing carbon dioxide, and if the container is airtight the grain may be stored indefinitely without further damage from weevils.

2. After nearly filling the container place a lighted candle on top of the grain and seal the container. The burning candle exhausts the oxygen.

In these two treatments the container must be completely sealed.

Fumigation with Carbon Bisulphide.

Should grain stored in silos, tanks, or other airtight containers, become infested with insects, it may readily be fumigated, and for this purpose carbon bisulphide may be used.

This liquid, which gives off a gas heavier than air, may be poured into a shallow tray on top of the grain, or on to a bag placed on top of the grain itself, after which the opening or door should be carefully sealed. Where gas-tight containers, or receptacles which can be made reasonably airtight by sealing, are available, the carbon bisulphide is used at the rate of 5 lb. (approximately 3 pints) to each 1,000 cubic feet the container will hold, no notice being taken of the actual amount of grain stored. A silo or shed that holds 1,000 bushels of grain when full, has an air space of approximately 1,300 cubic feet.

The gas is allowed to act for twenty-four hours or longer, but when the grain is required for seed purposes, the twenty-four hours should not be exceeded. After fumigation the tank or silo, etc., should be opened up to allow the fumes to escape.

WARNING.—*Carbon bisulphide is explosive.* Carbon bisulphide has the disadvantage that its gas, when mixed with air, is highly inflammable and explosive. *No light of any description (pipes, cigarettes, fires or embers, radiators, stoves, etc.) must be allowed in or near sheds or buildings during the process of fumigation with carbon bisulphide.* The precaution should also be taken of cutting off the electric current. Hot steam pipes have been known to cause explosion of this gas, and the steam should be cut off and the pipes allowed to cool before proceeding with fumigation.

It should also be realised that any fumigant that is toxic to insects is also toxic to man, and that it is necessary to take every

precaution to avoid exposure to heavy concentrations of fumigants. Some fumigants even may lack a distinctive odour at concentrations toxic to man.

Alternative Fumigants.

On account of the risks associated with the use of carbon bisulphide, alternative safer, but less effective fumigants, are sometimes used. The carbon bisulphide may also be mixed with carbon tetrachloride (1 to 4) to avoid the risk of fire or explosion. Other commonly used mixtures are carbon tetrachloride (1 part), or ethylene dichloride (3 parts); or ethylene dichloride (3 parts), or trichlorethylene (1 part).

Methyl bromide, at 2 lb. per 1,000 cubic feet, has also been used experimentally with very good results, but this material has not yet been used commercially in this State and needs skilled operators for its use.

During the war years carbon bisulphide was used almost exclusively in Australia for the protection of wheat in stacks, which were enclosed in air-tight walls prior to fumigation.

DDT Treatment of Barns and Seed Maize.

Where there are proper storage facilitier on the farm, maize is best stored as shelled grain, but if such facilities are unavailable the cobs should be left unhusked.

Where intended for seed the unhusked cobs, or the shelled grain, may be treated with 5 per cent. DDT dust or 0.1 per cent. spray. This will protect the grain from serious damage for twelve months. The method should not be used for grain intended for human consumption or for stock feed.

Sheds for holding maize are best constructed with concrete or tight wooden floors.

Weevil-infested maize, or refuse about barns and fields, should be cleaned up early each spring, and the barns and sheds should be thoroughly sprayed with DDT to destroy weevils.

The Common Grain Moth (*Sitotroga cerealella*).

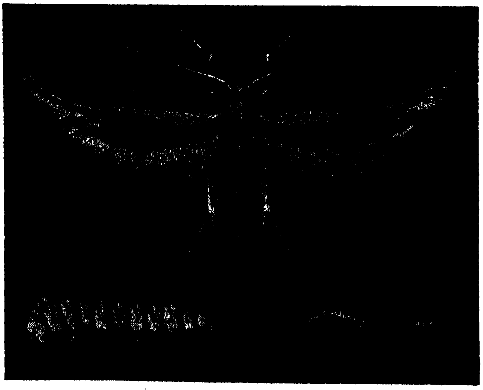
Infestation by this moth may occur in the field, one or several eggs being laid on the grain at the tip of immature ears. The grain may also be attacked during the storage period, and as the moth is active at lower temperatures than those favourable for weevils, it may cause more damage than these insects.

The caterpillar, on hatching from the egg, bores a hole into a grain and feeds within, until, when fully-fed, it eats its way towards the outside of the grain, leaving only a thin, circular layer of the seed-coat intact. It enters its pupal or chrysalis stage within the tunnel and later emerges as an adult moth, which pushes off the thin section of the seed-coat covering the exit to the tunnel.

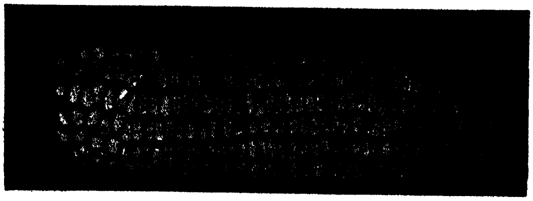
The adult, which measures about ½ inch across its outspread wings, is a yellowish or buff-coloured moth.

Numbers of generations develop during the year.

Control.—This moth is unable to emerge from closely packed shelled grain, stored either in bulk or in bags. Where maize is required for seed purposes it may be treated with DDT as recommended above for control of weevils.



Adult, Larva and Pupa of the Common Grain Moth.



Cob Showing Emergence Holes of the Common Grain Moth.

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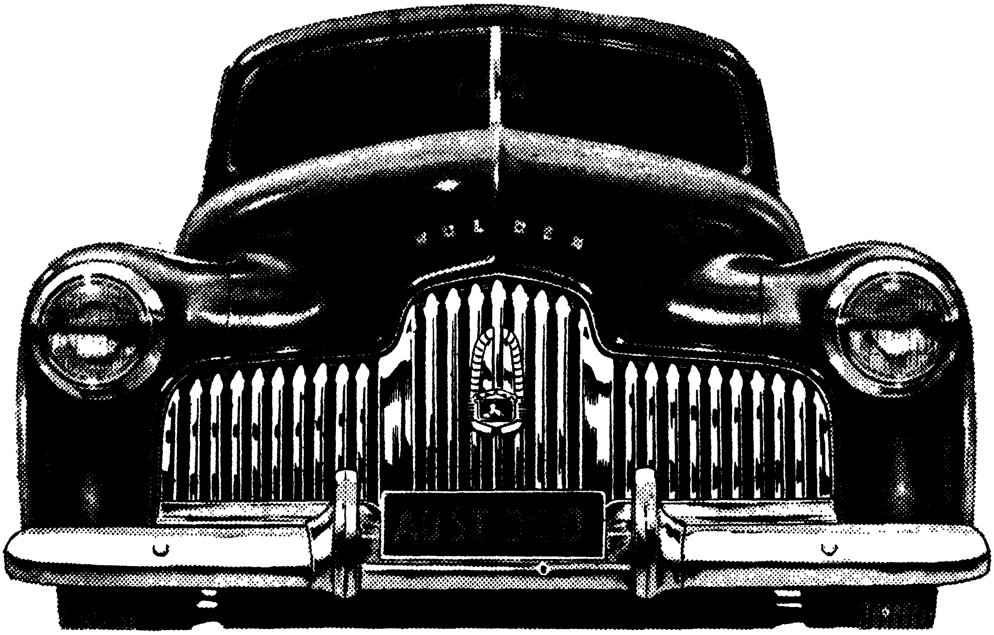

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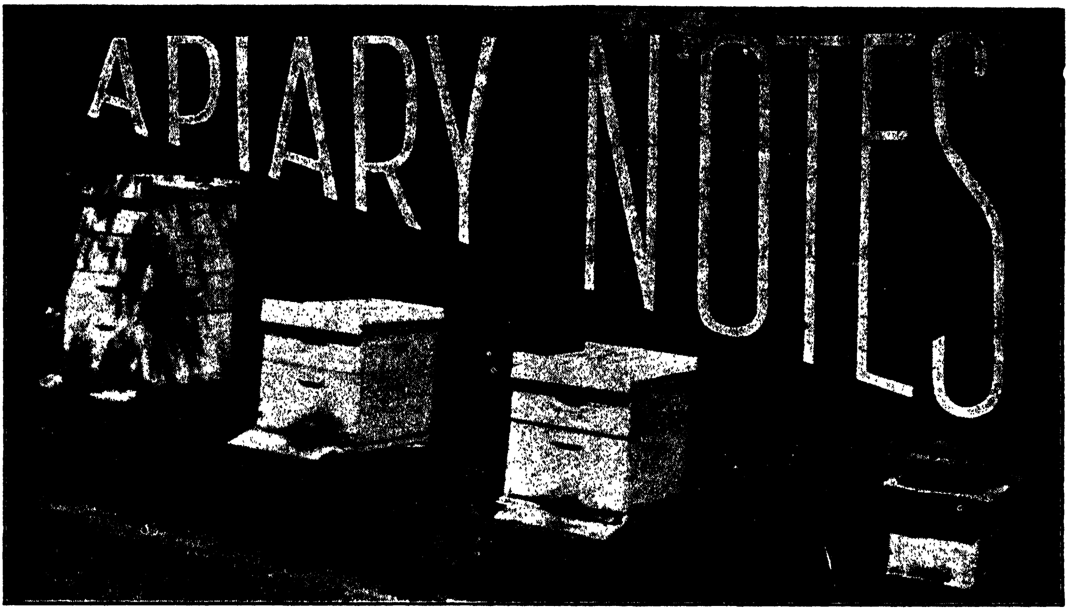


A Consideration of—

EXPORT MARKET PROSPECTS.

W. A. GOODACRE, Principal Livestock Officer (Apiculture).

THE bee-farming industry in New South Wales has been progressively extended during recent years, and this season, 1948-49, the production of honey has substantially exceeded any previous record.

The important marketing side of the bee-farmers' business has not caused him any very great concern recently, despite the fact that the exportable surplus has been increasing year by year. The demand for primary products, including honey, in overseas countries, both during the war and in this post-war period has been keen, and Great Britain has not failed so far to take all the available supply above local requirements. However, so much depends on maintaining a favourable export trade that we may be excused for feeling just a little anxious about the future.

There has been no substantial increase in recent years in the price of honey on the overseas market, as in the case of some other primary products; mainly the returns from exports have been little above the border line, which leaves no margin for any reduction in the price of honey.

No Cause for Alarm at Present.

On the credit side, the bee-farmer has a product with special keeping qualities. In view of this, a temporary difficulty in marketing a heavy volume of honey, such as that produced during 1948-49, should not become a cause for alarm in the industry. Some individual cases of financial hardships may, of course, result from an endeavour to carry on with any advance payment that may be made.

Bee-farmers generally are in a much better position than producers of perishable products who more often come up against temporary difficulties in marketing and are faced with a complete loss. Heavy production of honey is not likely to occur next

season, and the marketing of any carry-over may well be completed, particularly if export to Great Britain is continued, as in previous years.

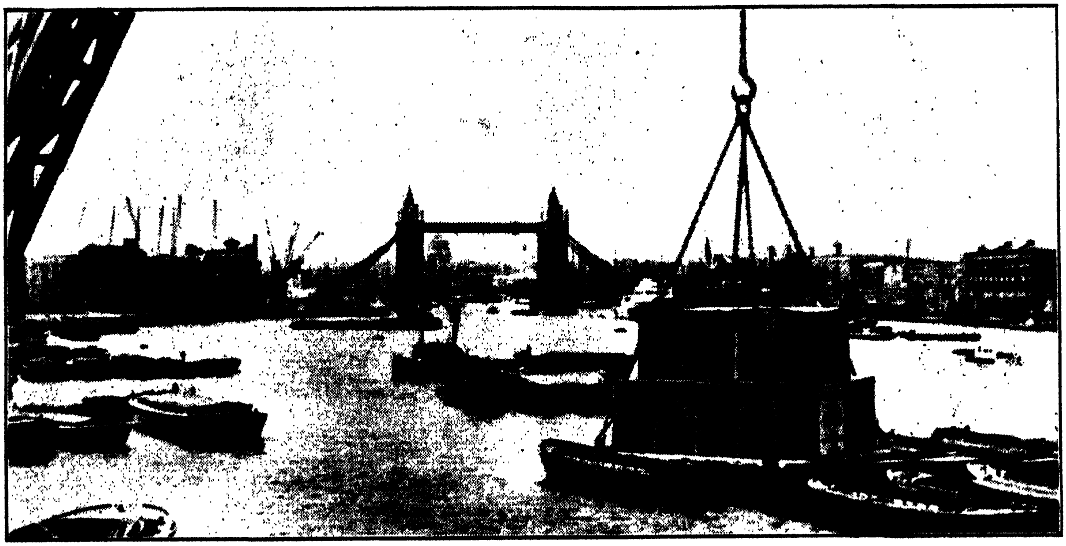
Position is Being Carefully Watched.

Everything possible is being done to ensure the future of our export trade in honey to Great Britain. The Department of Agriculture and Commerce is closely watching the position and keeping the Trade Commissioner in London fully informed of any matters needing attention in the interests of the Australian honey export trade.

Concerning prices in England, an extract from a recent report published in the *Australian Bee Journal*—a Victorian publication—under the name of D. J. Robinson, Manager of the London Honey Floor, is of considerable interest.

Mr. Robinson states that—"the situation is being closely watched and there does not appear to be any likelihood at present of a reduction in values. It is realized, of course, that 72s. 6d. per cwt. sterling is a maximum rate to prevent any increase, as the Treasury is definitely against any upward trend in food prices. It appears almost certain that the retail prices of honey to the consuming public will be reduced 1d. per pound.

"Importers, merchants, wholesalers and retailers are to bear approximately an equal share in this reduction, and should there be any action taken by any of the four parties just mentioned to recover such a small loss of revenue it would seem that lower values may be fixed for honey that does not reach choicest first-grade quality. It is already realised that the present guarantee of 72s. 6d. per cwt. for 7,500 tons protects Australian exporters only. But this must mean, with the reported large quantities of Australian honey available, that buyers to safeguard themselves, will definitely not be offering high prices except for best quality honey."



Unloading Australian Honey Into Barges on the River Thames, London.
Recent consignments' have included large numbers of 40 gallon drums.

An Australian Honey Floor in London.

The establishment of a honey floor in London is a recent innovation and is being sponsored by the Producers' Distributing Society. Bee-keepers' Associations are taking an active interest in the establishment of the honey floor, on which it should be possible to deal with the main volume of honey exported from Australia. The floor should ensure, too, that the right grades of honey are available for marketing in Great Britain, which is a very important factor at the present time.

It appears that with matters settling down in this post-war period, there is a tendency to review the position in regard

to prices of food products in Great Britain, and to get down to some sound, rational basis. However, in respect to honey it will, no doubt, be realised that the price has been kept down to a bare minimum all along, and all available supplies have been shipped to Great Britain. In view of this no special drive to exploit any other market could be made.

Taking all aspects into consideration, we should take a reasonably optimistic view of the future of the export trade. At present we have the advantage of a favourable sterling exchange, and being in the sterling groups has special significance as matters now stand.

Apiary Exhibits at Royal Show.

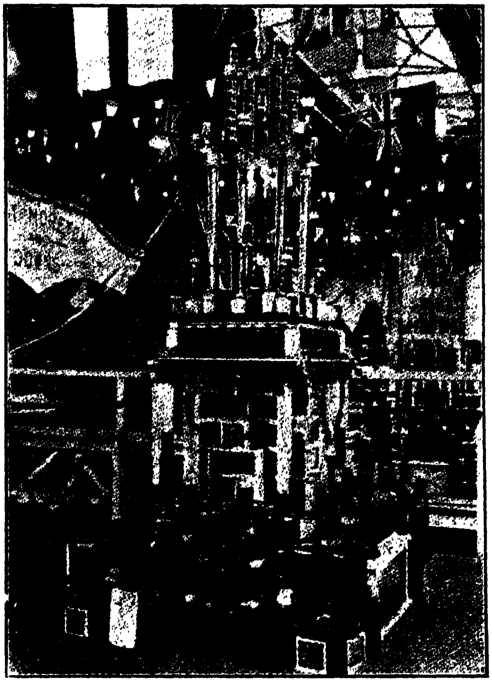
The new honey stand in the Agricultural Hall at the recent Royal Agricultural Show attracted a great deal of interest, and will do a great deal to influence beekeepers to increase the number of entries in future. The Royal Agricultural Society is to be congratulated on designing and erecting this new, attractive stand for competitive exhibits. The lighting from under the glass surface of the stand shows up the honey and beeswax exhibits to the best advantage.

Winners of special prizes in the section—Apiculfure—at the Royal Show were as follows:—

Six jars, for beekeepers, not less than twenty colonies.—Miss J. V. McGrath, 86½, 1; S. Hutchison, 84, 2; T. L. Purvis, 83½, 3.

Trophy, exhibitor gaining highest points for one exhibit.—J. White, 96, for liquid honey from orange blossom.

Champion; Medallion and Certificate for most successful exhibitor in Queen bee classes.—L. C. W. Smart, 89.



A Suggestion for Display of Apiary Products.

Medallion and certificate for best six jars in open classes.—J. White, 96.

Championship for collection of apiary products.—S. J. Young, 52.

Gold medal, most successful exhibitor; Queen bees, beeswax, and bulk honey.—L. C. W. Smart, 19.

Pig Industry Cost Survey.

IN promising the full support of officers of the New South Wales Department of Agriculture to assist the Commonwealth Government in its cost survey of the pig industry, Hon. E. H. Graham, M.L.A. (Minister for Agriculture), suggested that the work should be commenced at the earliest possible date.

"Already we have adopted the cost of production principle for the wheat and dairy industries, and I hope it will be possible to adopt a similar principle for the pig industry in the not too distant future. This would give a lot of encouragement to pig breeders," said Mr. Graham.

Mr. Graham added that Australia had developed over the years a type and quality of pig carcase which met the bacon standards demanded overseas. "In fact, Australian types are quite equal to if not superior to those of the United States of America, Canada and, in many breeds, the United Kingdom," continued the Minister.

Mr. Graham said that while the present abnormal demand lasted, pig-breeders could dispose of their produce without any difficulty. However, they would be wise to continue their efforts to improve the type and quality of their pigs.

"This will help Australia to retain a fair share of the world's markets when competitive selling again prevails and consumer countries pay more attention to quality," concluded the Minister.

A Specimen

CEREAL SHAREFARMING AGREEMENT.*

THE specimen cereal sharefarming agreement set out below has been drawn up by the Department of Agriculture for the guidance of both owners and sharefarmers. It is designed to ensure an equitable return to each from the working of the property, and to enable the adoption of methods of soil and animal husbandry that will maintain the fertility of the soil.

AGREEMENT made the..............................day of..............................19..........
BETWEEN..............................of ....
..............................in the State of New South Wales (hereinafter called the "landlord") of the one part AND ....of..............................
..............................in the said State (hereinafter called the "farmer") of the other part WHEREBY the farmer agrees with the landlord to work and sow during each wheat season that this Agreement shall remain in force all that piece or parcel of land having an approximate area of..............................
..............................acres and being..............................
....
..............................AND to reap and harvest the crops so sown by him upon the terms and conditions following :—

1. This Agreement shall commence on the..............................day of..............................19.......... and shall remain in force until the ....day of..............................19.........., unless at the expiration of that period wheat still remains to be harvested under the Agreement in which event the Agreement shall continue until the wheat is harvested.

2. The farmer shall, unless prevented by adverse weather conditions, commence soil preparation of the land to be cropped on or about the ....day of ....
in each season or as soon thereafter as the ground shall be workable and shall continue such soil preparation with his full plant from one working day to another without interruption (except while prevented by adverse weather conditions) until completed. All soil preparation shall be done in a workmanlike manner. The initial ploughing or cultivation shall be done to a depth of ....inches, measured from the surface of the undisturbed soil.

3. The farmer shall properly prepare the land and drill in the seed at the approved time and at the rate of..............................lb. for every acre sown, and shall, at the time of such sowing, drill in with such seed at least..............................lb. of superphosphate to every acre sown as aforesaid. All headlands shall be properly prepared and sown. No seed shall be sown after the..............................day of..............................except by mutual agreement.

4. The farmer shall thereafter keep the ground in proper order and condition by harrowing or rolling as may be necessary.

5. The farmer shall cut a track as legally prescribed or of not less than ....feet wide around the crop, and any tracks which shall be necessary for the proper working of the harvesting machine. The farmer shall cart and stack the whole of the hay so cut, and thereafter he shall be entitled to receive ....of such hay and the landlord shall receive ....
As soon as the track aforesaid has been cut round the crop the farmer shall plough a firebreak of ....feet wide.

6. If the parties hereto shall mutually agree that it is advisable to cut any portion or the whole of the crop for hay, the farmer shall cut, bind and stook the said crop, and all hay so cut, whether in pursuance of this clause or of clause 5, shall be stacked by the farmer in such place as the landlord shall direct in a proper and workmanlike manner. All hay cut in accordance with this clause shall be divided equally between the landlord and the farmer, but the landlord shall pay to the farmer the sum of ....per ton of the landlord's share as remuneration for carting and stacking the same.

7. As soon as the crop is ripe in the opinion of the landlord, the farmer shall commence and continue without interruption (save while prevented by adverse weather, strike, or other unavoidable cause) to harvest the same, and as soon as practicable thereafter, unless otherwise agreed, shall deliver all the wheat to ....
All work referred to in this clause shall be done in a proper and workmanlike manner and so that the produce shall be placed in the best marketable condition.

8. The farmer shall, for the convenience of loading, make the stacks of wheat in the field as large as practicable, but so that they shall contain not less than ....bags.

---

* Any provision in this Agreement which the parties do not wish to become a part of their contract should be crossed out in ink identically on all copies of the Agreement.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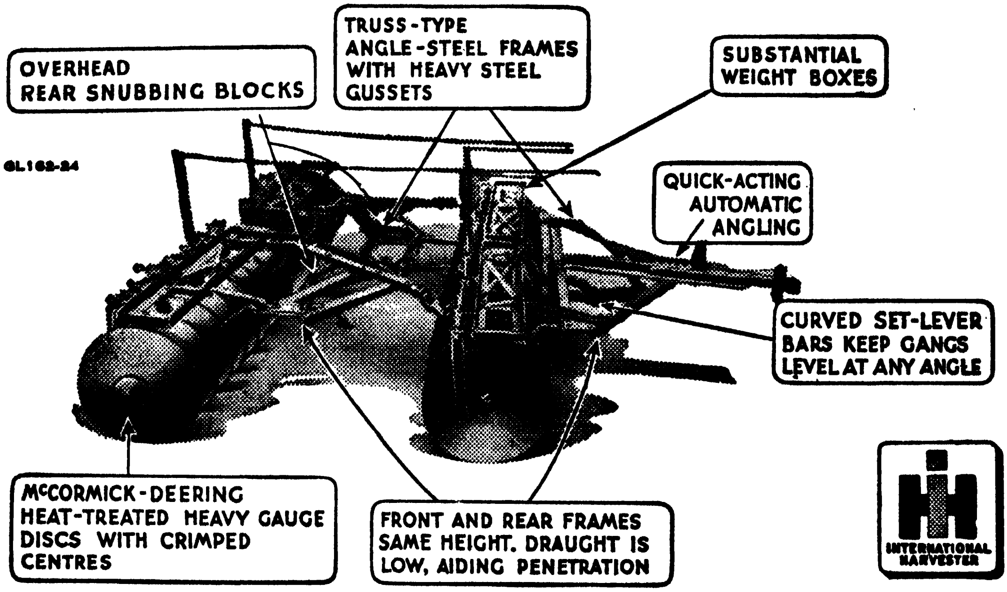

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INTERNATIONAL HARVESTER

Such stacks shall be protected against fire by having a strip of at least 12 feet wide around the said stacks cleared of stubble. Should rain make it necessary, such stacks shall be placed upon timber. Costs thereby incurred in the provision of timber and labour shall be shared equally by the landlord and the farmer.

9. Provided that the terms of this Agreement have been duly observed by the farmer, he shall be entitled to and shall receive .... of the crop and the landlord shall receive the remainder of the crop.

10. Unless otherwise agreed to divide, and each to take his share as harvested, the farmer shall cart, as soon as possible after the wheat is harvested, all wheat to..

....

The landlord shall pay the farmer .... per ton in respect to the cartage of his share. Where the wheat is carted to official receiving depots, the division of shares shall be as delivered.

11. The landlord shall supply on the property :—

(*a*) All necessary seed, sufficient to sow the land at the rate hereinbefore provided, graded and dusted with copper carbonate at 2 ounces per bushel or with such other fungicide as may be agreed upon.

(*b*) Half the amount of superphosphate required for manuring the land as hereinbefore provided.

(*c*) Bags and twine for his share of the crop.

The farmer shall supply on the property :—

(*a*) Half the amount of superphosphate required as aforesaid.

(*b*) Bags and twine for his share of the crop.

(*c*) Except as herein otherwise provided, all machinery, implements, fuel, horses, fodder, carts, materials, and labour necessary to properly carry out the terms of this Agreement.

12. The Farmer shall return the landlord's empty seed and superphosphate bags to a place upon the property agreed upon, within 30 days of completion of sowing the crop.

13. All horses which the farmer may require in and for the performance of this Agreement may be depastured by him in a paddock which shall be provided by the landlord, but the farmer shall not be entitled to take on agistment on the said land the horses or other live stock of any other person.

14. The landlord shall have all grazing rights of the said land prior to the commencement of sowing the crop, and after the completion of harvesting operations. Harvesting shall be deemed to be completed when all marketable hay and grain have been removed from the paddock.

Eating off of green or growing crops shall not be done, except with the written consent of the farmer.

A crop left without effort to harvest on .... day of .... shall be considered to be a " failure." A " failed " crop shall become the property of the landlord upon payment of .... shillings per acre to the farmer for his portion of the crop.

When either the landlord or farmer considers that a crop is a failure prior to the above date, and agreement cannot be reached, the matter shall be referred to .... for his decision, which shall be final.

15. The landlord and farmer shall keep all stray and strange stock off the said land, and shall prevent any stock having access to the crop.

16. The farmer shall not permit any smoking in the field during harvest, except at recognised times agreed upon by the landlord, and shall not fire any stubble or chaff heaps unless with the consent of the landlord. The farmer shall comply with all regulations governing the prevention of fires.

17. The farmer shall not bring any dirty or otherwise objectionable horse feed upon the said land, and he shall cut down and eradicate all noxious weeds on the said land, and shall in all respects comply with the provisions of any laws relating to noxious animals or plants.

18. If the farmer shall fail with all expedition to prepare the said land or to sow and harvest the crop, or shall fail to perform anything hereby agreed to be done at the time specified, the landlord may perform or complete any such thing in such manner as he thinks fit, and the share of the farmer in any crops on the land shall stand charged with the payment to the landlord for the expense of performing and completing any such thing, and the landlord may retain the whole of the share of the farmer in the said crop, or so much thereof as in his opinion shall be sufficient to recoup him the expense of performing and completing any such thing as aforesaid, with full power to sell and dispose of the same at such time and in such manner as he thinks fit, and out of the proceeds of the sale thereof to pay the expenses of and incidental to such sale or sales and to retain and repay himself the expense of performing and completing any such thing as aforesaid, and the balance (if any) remaining in his hands shall be paid by him to the farmer.

19. The landlord may, for any of the causes mentioned in paragraphs (a) to (f) of Section 15 (1) of the Agricultural Holdings Act, 1941, determine this Agreement forthwith by notice given in accordance with the Act. Such notice shall be deemed to be sufficiently served if sent by post addressed to the farmer at his usual or last known place of residence in New South Wales.

20. The farmer shall not mortgage, assign, or sublet the contract or his interest therein or in the said crop, without the consent in writing of the landlord first had and obtained.

21. The farmer shall be entitled to occupy the house erected on the said land and the appurtenances thereto free of rent during the term of this Agreement, but no license or right of occupation given to the farmer by this Agreement in respect of the said land shall be construed to create a tenancy to the farmer.

22. The farmer shall, on the expiration of the term hereof, vacate and leave the said land, and shall remove therefrom all stock, machinery, carts, implements and things which he shall be entitled to remove.

23. If any dispute arise under this Agreement, the same shall be referred to the arbitration of .... or such other person as may be agreed upon, and the decision of the said or of any such other person shall be final and binding on the parties hereto.

24. The farmer agrees to indemnify the landlord against any claim in respect of any accident to any farmhand employed in connection with the work to be carried out under this Agreement.

25. This Agreement shall be subject to the Agricultural Holdings Act, 1941, in all respects and nothing herein shall affect the rights, remedies and obligations of the landlord and the farmer respectively under the said Act.

AS WITNESS the hands of the parties hereto the day and year first before written.

SIGNED by the said ....
in the presence of ....

SIGNED by the said ....
in the presence of ....

Orange Grading Regulations to be Enforced.

"FRUIT INSPECTORS of the Department of Agriculture will, during the next few weeks, carry out tests of oranges consigned to the markets to ensure that they have attained maturity. Where the fruit has not reached a mature condition, sales will not be permitted and growers will be liable to prosecution under the Plant Diseases Act."

In making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that, with the end of the season for late Valencias, it is customary to find that growers are anxious to market Navel and other oranges which are approaching maturity.

"Compared with mature Valencias, new season's Navels frequently have a very acid taste. This factor, often combined with poor colour, induces consumers to defer buying until the fruit is sweeter. As a result, the value of the new crop is quickly depressed and price recovery is made difficult owing to rapidly increasing supplies," said Mr. Graham.

"The Citrus Grading Regulations provide that oranges shall be mature," continued the Minister. "This condition is only met in respect of Navel oranges when not more than 24 c.c. of N/10 Soda is required to neutralise the acid in 10 c.c. of juice.

"Another requirement of the Regulations is that the fruit shall not be dry," added Mr. Graham. "Dryness is an offence when the expressed strained juice of oranges fails to weigh not less than 33 per cent. of the gross weight of the fruit. Some samples of Valencias at present being marketed cannot comply with that standard, and packers are warned that a higher standard of juice content must be maintained. Valencias most likely to be affected are from trees which were severely affected by frosts last winter," concluded the Minister.

School for Pig Raisers at Hawkesbury Agricultural College.

A SCHOOL of Instruction for pig raisers is to be held at Hawkesbury Agricultural College, Richmond, from Tuesday, 12th, to Friday, 15th July next. Making this announcement the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said: "This School of Instruction aims to provide a short course of training in general pig raising, including specialised instruction in judging pigs, alive and in carcase form."

Accommodation for the School (which is for males only) will be limited, and pig raisers desirous of attending should lodge their application early in order to avoid disappointment.

The fee for the course will be £1 10s. 0d., which will include tuition, board and lodging, and medical attention at the College. The fee should not be forwarded until notification of acceptance for the course has been received by the applicant.

Rail concession fares will be available to pig raisers attending the School.

Application forms and Syllabus may be obtained from the Under-Secretary and Director, Department of Agriculture, Box 36, G.P.O., Sydney, with whom applications for admission to the School should be lodged by not later than 1st June.

NEW TRAINS
For
New South Wales

Two modern air-conditioned expresses are now operating between Sydney and Newcastle, and it is expected that two more of this type of seven-car train will be operating before the end of the year.

Daylight express services will be improved by the introduction of eight eight-car air-conditioned trains; the first of these will soon be placed in service, and the second will be ready for service within the next six months.

Recently two diesel rail motor trains have been placed in service on branch lines in the Dubbo District. It is anticipated that by the end of the year as many as six out of a total of ten of these two-car units will be operating.

Ten diesel air-conditioned trains will also be built to improve country services and it is expected that the first of these three-car units will be completed early next year.

S. R. NICHOLAS,
Secretary for Railways.

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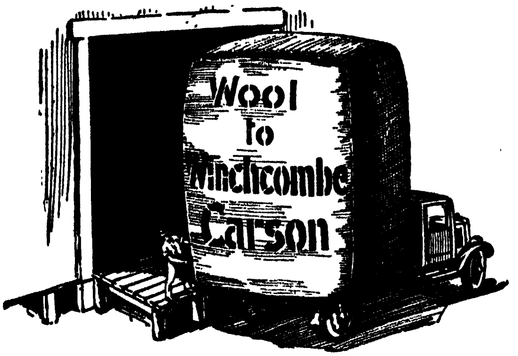

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COMMON INTERNAL PARASITES OF HORSES

May Cause Ill-health.

THEIR RECOGNITION AND TREATMENT.

(*Concluded from page 210.*)

VERY few horses are entirely free from infestation with one or more of the numerous species of worms or internal parasites that may infest them. Infestation of sufficient degree to cause ill-health in horses is not common under ideal conditions, but, on the other hand, horses kept under adverse conditions may frequently be affected. In general, horses carrying an excessive number of internal parasites are subject to digestive disturbances and loss of condition, and are unable to perform the usual amount of work.

In the first portion of this article, which appeared in April issue, the common internal parasites of horses and their effects were described. Methods of prevention of infestation and of treatment are discussed in this concluding section.

Prevention.

Efforts should always be made to prevent horses, more particularly young stock, from becoming infested. Except in the case of the large stomach worm and bots, the infestation is acquired by horses grazing over pastures previously contaminated by droppings containing parasite eggs. These eggs may remain alive for a period of several weeks or even months, especially in damp or swampy locations. It is, therefore, recommended that where possible, such paddocks should not be used for young stock.

Under normal conditions, the lower the rate of stocking, the less the danger of internal parasitism becoming a problem. However, in a wet season, even when only one or two horses are grazed in a paddock, a high degree of infestation may be built up. For this reason, permanent horse paddocks are most undesirable. Small paddocks, useful for this purpose, should be used for rotational grazing with other stock.

It may surprise some to learn that very young foals frequently become infested by nibbling at droppings. Stabled horses in work are generally not worried by worm infestation for the reason that their food is uncontaminated. Feeding from the ground on the other hand is a dangerous practice, and if, during times of drought such a practice has to be adopted, care should be taken to see that the place of feeding is frequently changed before the site becomes excessively contaminated.

The large stomach worm is spread by the stable-fly. If trouble from this parasite is experienced, the fly population must be reduced. To do this, the inner surface of the roof and all rafters should be sprayed with 4 per cent. DDT. in kerosene every two months during the warmer weather.

In the case of stabled and groomed horses, bot fly infestation can be readily controlled by preventing the eggs from hatching. Removal of the eggs during grooming, though tedious, is the most efficient means of control. Almost as effective is to wipe over the areas where the eggs are deposited, each week with a cloth soaked in a 2 per cent. phenol solution.

Where previous experience shows that trouble from internal parasites is likely to be experienced, routine treatments may have to be adopted to supplement the other control measures mentioned. In this way infestations are prevented from reaching serious proportions. It is of interest to note that in certain parts of America, where roundworms and bots were previously troublesome, routine treatments have been widely adopted with very satisfactory results.

Treatment.

No single drug has yet been found which is effective against all the parasites dealt with. On the other hand, most of the preparations described below are effective against more than one species.

The principal drugs used are phenothiazine, carbon tetrachloride, oil of chenopodium, carbon bisulphide and oil of turpentine.

Phenothiazine.

This drug has only been in use in this country for about eight years, and it has long been recognised as an outstanding preparation for the treatment of sheep for worm infestation. It is also highly a efficient preparation for use with horses. Although it can normally be used with safety, on rare occasions it can be toxic and cause losses. It is therefore, advisable to adopt the precautions set out below when using it.

Horses in ill-health or in weak condition should not be dosed, nor should the drug be used for mares heavy in foal. Starvation prior to treatment is not necessary. The drug, which is a green powder, is administered in a bran mash, and a further bran mash is given 6 hours later. It is advisable to divide the dose into three equal portions, one portion being given each day for three days. It should be noted that following dosing, the urine becomes discoloured, and such an occurrence is quite normal with the use of this drug.

The dose rate for phenothiazine is 1½ oz. for draught horses, 1 oz. for hacks and 2/3rd oz. for ponies with a reduction for foals depending upon their size.

Phenothiazine is very effective against redworms and is moderately effective against roundworms. Although it is not effective against the other species, because of the ease of its administration and the fact that supplies are frequently on hand, it is increasing in popularity.

Carbon Tetrachloride.

Though slightly less efficient than phenothiazine for removing redworms, this preparation has the added advantage of being reasonably satisfactory for bot treatment. Usually it can be used with safety, but on fairly rare occasions it may cause losses. It is, therefore, necessary to adopt the precautions set out below to reduce the risk.

The horse should be starved for 24 hours before treatment and then drenched with the drug mixed with paraffin or linseed oil. The dose of the preparation is 5 c.c. to 100 lb. liveweight, mixed in 1 to 2 pints of either of the oils mentioned. On this basis the appropriate doses are 30 c.c. or 1 oz. for ponies; 50 c.c. or 1-2/3rd oz. for hacks and up to 75 c.c. (2½ oz.) for draught horses.

The doses mentioned are for the pure drug. Frequently, carbon tetrachloride as used for drenching sheep may be on hand. It is quite suitable for use, but as it is already mixed with some paraffin oil it must be given in greater quantities than the pure drug. Single strength carbon tetrachloride consists of one part carbon tetrachloride to four parts of paraffin oil and the double strength mixture is twice as strong. The dose rates will, therefore, be five times and two and a half times respectively, as great as when the pure drug is used.

Instead of giving as a drench, carbon tetrachloride may be given in a capsule, but due to the danger of burning the horse's mouth should the capsule burst, this method of administration should be attempted only by experienced operators.

Another method of administration is the use of the stomach tube through which the material is poured direct into the stomach. Briefly, it consists of passing into the gullet or oesophagus, a rubber tube of about 5/8 inch diameter, which has been well lubricated with vaseline. The tube is passed through one nostril, and then into the gullet. This latter operation is rather tricky and should not be attempted until the method has been demonstrated by an experienced operator. It has one great advantage in that, even if an unruly horse has to be thrown, it can still be treated by this method.

Carbon Bisulphide.

This is the classical treatment for bots. It is, however, very effective against roundworms and the large stomach worm. It has one disadvantage in that the carbon bisulphide must be given in a capsule, and as stated earlier, this operation is not without risk if inexpertly carried out. For 24 hours before treatment the animal must be starved, but given access to water. However, no food or water is to be allowed for 5 hours after treatment. Under no circumstances follow treatment with a purgative; it is dangerous.

Here again the stomach tube may be used to advantage.

The dose rates, on the basis of 2 c.c. for each 100 lb. live weight, are ponies 10 c.c., hacks 20 c.c. and draughts 25 c.c.

Oil of Chenopodium.

Oil of Chenopodium is very efficient against roundworms. It is less efficient than the other preparations mentioned for redworms and should be used only where roundworms are the main problem. It may be safely used if the directions given below are followed, except that it should not be given to pregnant mares, while the dose for thoroughbreds should be reduced by one-fifth.

It is given mixed in 1 to 2 pints of linseed or paraffin oil following 36 hours starvation. If necessary, the stomach tube may be used. Food and water must not be allowed for 6 hours following treatment. If the bowels have not worked, a further dose of oil must be given 24 hours after treatment. The dose rate is the same as for carbon bisulphide.

Oil of Turpentine.

This preparation must not be confused with "mineral turpentine" which is poisonous. Although a favourite with many owners, oil of turpentine is a very inefficient treatment for worms. Its use, therefore, is not recommended. It is given mixed with 1 to 2 pints of linseed or paraffin oil, the dose rate being the same as for carbon tetrachloride.

Notes on Treatment.

Choice of Drug:—In choosing the drug to be used for treatment, one is influenced by the condition to be treated, safety of treatment, cost and availability of the various drugs, and ease of administration.

Method of Dosing.—In drenching, one should use either a drenching bit and funnel, or a bottle with a piece of hose pipe over the neck to prevent breakage. The horse's head should be elevated slightly to allow the drench to be readily swallowed. The drenching must be discontinued if the horse struggles, or the fluid may be inhaled and cause pneumonia.

Indications for Treatment.—Worm infestation must be suspected when horses on good feed become unthrifty, or when young horses cease gaining weight, lose condition and become harsh in the coat. A correct diagnosis must then be made by having faecal samples examined, and if necessary treatment should follow. Treatment is also

THE FOLLOWING TABLE SUMMARISES THE USES OF THE PRINCIPAL DRUGS.

Drug.	Dose Rate.	Method of Dosing and Precautions.	Uses
Phenothiazine... ...	Draughts, 1½ oz., hacks, 1 oz., ponies, ⅝ oz.; or 1 oz. per 100 lb.	Given in bran mash, followed by further mash in 6 hours. No prior starvation necessary. Safest if dose divided in three and given over period of three days. Do not treat weak horses.	For redworms.
Carbon tetrachloride ...	Draughts, 2½ oz., hacks, 1⅝ oz., ponies, 1 oz.; or 50 c.c. (1⅝ oz.), per 1,000 lb.	Starve for 24 hours. Follow with drug mixed in 1 to 2 pints linseed or paraffin oil; or drench in capsule, or by stomach tube. Do not treat weak horses.	For redworms, roundworms and moderately effective for bots.
Carbon bisulphide ...	Draughts, 25 c.c., hacks, 20 c.c., ponies, 10 c.c.; or 20 c.c. per 1,000 lb.	Starve for 36 hours before treatment. Withhold food and water for 6 hours after treatment. Give in capsule only if experienced, or by stomach tube. Do not follow with purgative.	For bots, good also for stomach worms and roundworms.
Oil of chenopodium ...	As for carbon bisulphide.	Starve for 24 hours prior to treatment and withhold food and water for 6 hours after. Give as drench in 1 to 2 pints linseed or paraffin oil or by stomach tube. Give further dose oil in 24 hours if necessary. Do not use for pregnant mares.	Good for roundworms and fair for pinworms.

This chart is intended for ready reference. If fuller information regarding treatments is necessary, consult the earlier sections on the various drugs that may be used.

indicated where previous experience shows that worm infestation is likely to be a worry.

Time of Dosing.—This matter is of importance where routine treatments are carried out. In the case of bots, for example, treatment in early winter will remove the bot larvae before they mature, and re-infestation does not then occur till early summer owing to the inactivity of the fly. Treatment of pregnant mares in mid-pregnancy is frequently advisable to reduce the risk of infestation of the foals. It is also desirable, at times, to treat foals prior to weaning so that they will not receive a check from this cause.

Departmental Officers to Study New Zealand's Dairy Industry.

MESSRS. G. MCGILLIVRAY, Chief, Division of Dairying and I. W. Scott, Special Dairy Officer, of the Department of Agriculture, left Sydney by the Wanganella last month for New Zealand, where they will make a close study of the dairy industry.

In making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that in addition to examining various aspects of New Zealand's dairy industry, Messrs. McGillivray and Scott would purchase dairy stock to assist in improving the standard of dairy herds in this State.

"In authorising the purchase of a number of high-class Friesian heifers for the Department's Friesian Stud at Hawkesbury Agricultural College, together with a registered polled Jersey bull, I had in mind that polled cattle have a definite place in the development of the dairy industry in New South Wales," added Mr. Graham.

"Mr. Scott will also make a special point of examining the Herd Recording Scheme which New Zealand has developed so successfully," continued Mr. Graham. "Our own Herd Recording Scheme is most satisfactory but it is always wise to keep abreast of developments in other countries."

Mr. Graham said that the two officers would also carry out an inspection of many dairy produce factories in New Zealand with a view to obtaining information which will be of use to manufacturers of dairy products in this State.

Rabbit Eradication Methods in New Zealand.

Minister Makes Inquiries.

THE Minister for Agriculture (Hon. E. H. Graham, M.L.A.) is making inquiries into New Zealand's methods of rabbit eradication.

"I have been in touch with the New Zealand authorities and have a copy of the New Zealand Act dealing with the suppression of rabbits in that country," said Mr. Graham.

"In New Zealand rabbit eradication is controlled by what is known as the "New Zealand Rabbit Nuisance Act." This Act provides for the constitution of Rabbit Districts and for the establishment of Rabbit Boards, commonly called 'Killer Boards'," continued Mr. Graham.

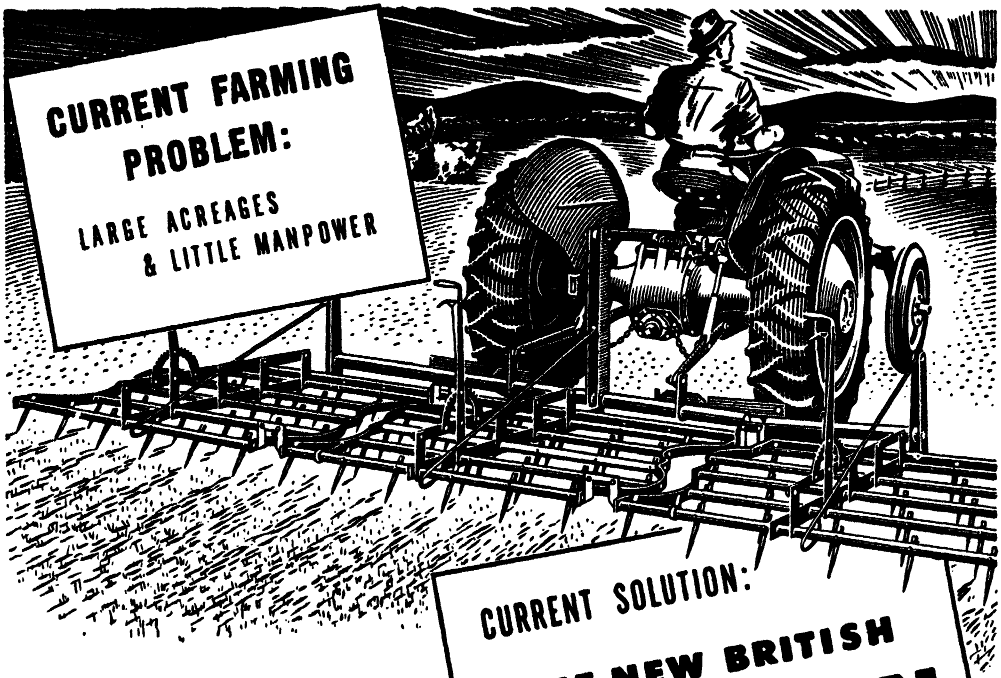
"The New Zealand authorities have been kind enough to send me all the information which they have been able to gather regarding the activities of their 'Killer Boards'." said the Minister.

"The experience of the New Zealand Department of Agriculture is that control by these boards has been a striking success. To date, 106 boards have been formed, covering an area of approximately 17½ million acres."

Mr. Graham said that since 1938, New Zealand's "Killer" Boards have had authority to destroy rabbits on private land. They carry out extermination operations throughout the entire year and special attention is given to landholders who, by neglecting their properties, are commonly known as Rabbit Farmers.

"I am making further inquiries into New Zealand's methods as well as other aspects of rabbit eradication which have come to the notice of my department," concluded the Minister.

AMONGST the more common causes of cannibalism in poultry are lack of animal protein (meat meal) in the diet, overcrowding, having the nest boxes too exposed, the occurrence of vent gleet in the flock, the accidental wounding or injury of a bird producing bleeding, or one or more of these causes acting together. Whatever the cause which acts as a starting point, it would appear that the habit is rapidly acquired and spreads throughout the flock.



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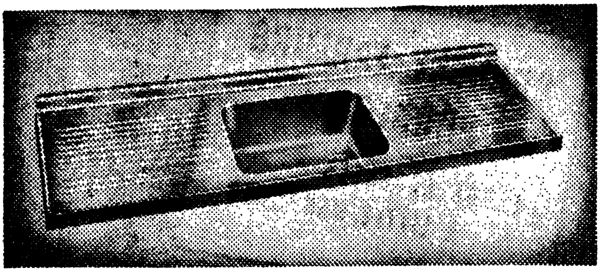

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Competition Pens at Hawkesbury Agricultural College.

Poultry Notes.

May, 1949.

E. HADLINGTON, Principal Livestock Officer (Poultry).

Comments on the 1948-49 Egg-laying Competition at Hawkesbury Agricultural College.

A CLOSE contest for the Grand Champion Prize marked the close of the 1948-49 Competition. Mr. W. F. Argall's team took the lead in egg value towards the finish, but was finally overhauled by Messrs. C. A. Clark and Son's pen which finished with a total value of £13 2s. 1d. for the 1,441 eggs laid.

Average Production.

There was a slight falling-off in the general average production compared with last year, the figures being 201.4 as against 205 in the previous year.

Out of the various breeds competing the one pen of Anconas laid the highest average number of eggs, viz., 207.1; fifty-four groups of White Leghorns followed with 204 eggs; Australorps averaged 198.91 for the twenty-four groups competing; three groups of Rhode Island Reds laid an average of 182.4; one group of Legbars averaged 172.0 and seven groups of Langshans averaged 191.0.

Highest Individual Scores.

The highest individual score was made by Mr. H. T. Chidzey's White Leghorn hen No. 72, which laid 306 eggs in 350 days of the test. As this bird may put up a record for light breeds in these tests she will be kept for the full 365 days.

The previous highest score in the light breeds was put up in 1924 by a hen owned by Mr. L. A. Ellis, of Ingleburn, which laid 309 eggs in 356 days. The competition at that time commenced on 10th April and concluded on the 31st March. These scores are by no means a record for this competition, as an Australorp hen, owned by the late Mr. A. R. Wheatley, laid a total of 338 eggs in 365 days in the year 1926.

Full Report of Egg-laying Competition.

FULL details of the 1948-49 Hawkesbury Agricultural College, Egg-laying Competition are available in leaflet form and will be supplied on application to the Department of Agriculture, Box 36A, G.P.O., Sydney.

Three of Messrs C. A. Clark and Son's Group of White Leghorns.

Winners of Grand Championship and Golden Egg Trophy.

The highest individual score in the heavy breeds was put up by a Langshan hen owned by Mr. R. F. Harris, which laid 292 eggs.

The Main Prize Winners.

The two major prizes, the A. A. Dunnicliff Grand Champion Prize for the highest market value of eggs and the Golden Egg Trophy donated by the Metropolitan Meat Industries Commission went to Messrs. C. A. Clark and Son whose group of White Leghorns laid a total of 1,441 eggs valued at £13 2s. 1d. and scored 96.1 points for quality and production.

An Australorp of the Team entered by Mr. P. Bevan who won the Grand Championship Consolation and Golden Egg Consolation Trophy.

This is a very creditable performance, especially in view of the fact that these breeders won the Golden Egg Trophy with a pen of Australorps in last year's competition.

The Grand Champion Consolation Prize and the Golden Egg Consolation Trophy were also won by one competitor, Mr. P. Bevan, whose pen of birds laid 1,370 eggs having a market value of £12 12s. 9d. and scored 83 points for quality and production.

The James Hadlington Memorial Medal which is awarded for weight of eggs, weight and quality of birds, was won by Mr. D. Taylor, whose group of six White Leghorns scored a total of 102.5 points. As this pen tied with that of T. R. Moyes in points, the allocation of this prize was decided on market value of eggs.

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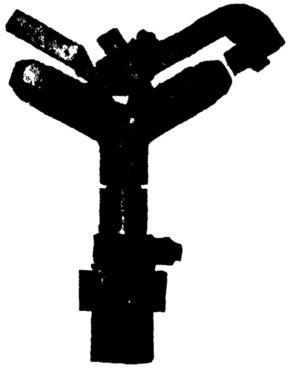

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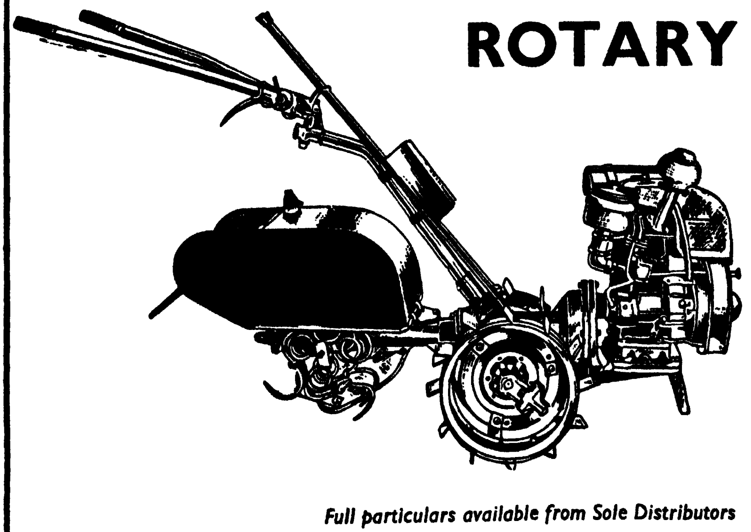

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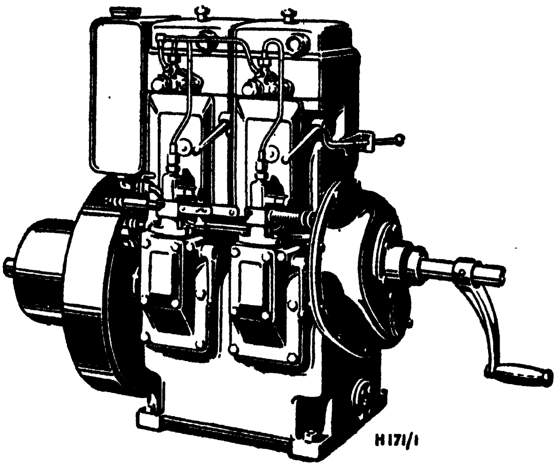

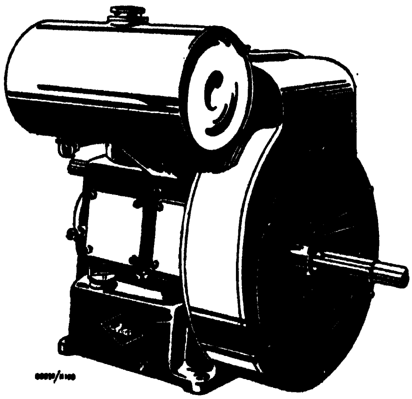

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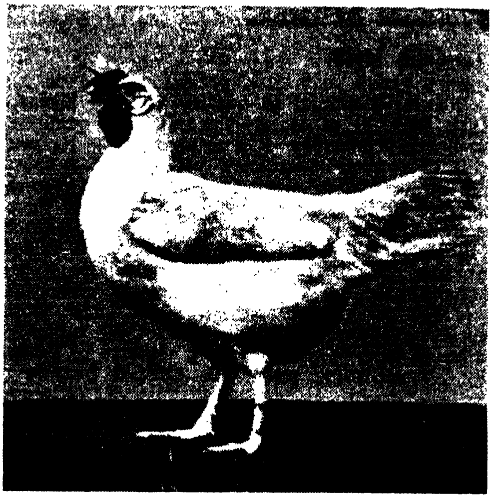

This White Leghorn Hen Laid the Greatest Number of Eggs in the 1948-49 Egg-laying Competition at Hawkesbury Agricultural College.
Owned by Mr. H. T. Chidzey.

Mr. R. F. Harris' Langshan which laid the Greatest Number of Eggs in the Heavy Breed Section.

The D. R. Dove Memorial Medal awarded on the same basis as the J. Hadlington Medal, but in the opposite section, was won by Mr. T. R. Moyes' pen of six Chinese Langshans, which also scored 102.5 points.

Mortality.

There was a slight increase in mortality compared with last year, the average being 7.2 per cent., compared with 5.4 in the last test.

Egg Weights.

The disqualifications for under-weight eggs were somewhat higher in this Competition than last year. The particulars are shown hereunder:—

1948-49.

	Individuals.		Groups.	
	No.	Per cent.	No.	Per cent.
Light Breeds ..	24	7.1	9	16
Heavy Breeds ..	16	7.8	6	17.6

1947-48.

	Individuals.		Groups.	
	No.	Per cent.	No.	Per cent.
Light Breeds ..	17	5.6	6	12
Heavy Breeds ..	10	4.2	4	10

The Financial Aspects of the Competition.

The gross return for eggs in this Competition was £1 17s. 4d. per hen, compared with £1 12s. 2½d. last year, after deducting marketing charges only, without any allowance for under-grade eggs. The cost of feeding, based on ruling Sydney wholesale prices, plus 6d. per bird to cover delivery charges, was 10s. 4d. per bird, leaving a return over cost of feeding of £1 7s. 0d. It will be realised, however, that the feed costs on the average commercial farm would be much greater than the wholesale price. Moreover, the cost of feeding in the Competition is based mainly on feeding pollard, bran, meatmeal, wheat and maize whereas on commercial farms more costly substitutes have to be used.

Again, the average return for eggs on commercial farms would be lower since the average production would be lower because the flocks are composed of approximately one-half hens and one-half pullets.

The estimated figures on commercial farms would be approximately 23s. 4d. for eggs after allowing for marketing charges. The cost of feeding from 1st April, 1948, to 16th March, 1940, would be 13s. 6d., leaving a return over cost of feed of 9s. 10d. This compares with return over cost of feed last year of 9s. 8d. per hen.

. . . SAVE FOR BETTER TIMES . . .

Herd Production Improvement Scheme.

Rules Amended from 1st July, 1949.

FROM 1st July, 1949, the Herd Production Improvement Scheme of the Department of Agriculture will operate on amended rules as far as the Division 2 or "Grade" section is concerned.

In the case of Division 1, or official section, rules are unaltered, with the exception that under exemptions, any cow over 10 years of age may be exempted, and the rule requiring 50 per cent. of the eligible cows in a herd to be recorded is to be enforced. In the case of members failing to give an assurance of complying with this rule the Department will have no option but to cease recording the herd.

In what was previously named Division 2, or the "Grade" section, the name has been altered to Group Recording. Group cows in future will refer to grade or pure-bred cows recorded under this section.

Fees for group recording will remain as for Division 2, *i.e.*, 6d. per test per month. Under the group scheme all cows must be recorded, subject to the following exemptions:—

1. Any cow over 10 years of age, provided she has one or more previous lactation records.
2. Any cow which is sick, diseased or injured.
3. Any cow which aborts her calf during a lactation period shall forthwith be withdrawn but may be re-entered.
4. Any cow for which special exemption is granted by the Chief, Division of Dairying.

Under group recording, provision is made for any identified animal to qualify for the Department's Register of Merit—the minimum qualification being production of a total of 1,100 lb. butterfat over three successive years, with a minimum of 300 lb. in any year. The only records published under group recording will be of those cows qualifying for entry in the Register of Merit at the end of the three-year period. It is hoped that this group record will satisfy the needs of many breeders of pure-bred cattle who wish to record production of their stock under commercial everyday conditions without the necessity for heavy feeding considered by some to be necessary for recording under the Official Section.

Where cows are entered to qualify for the Register of Merit the Department has the right of making a surprise check test on any cow or herd, and at least two check records will be made during the season.

Under the Group Scheme it is hoped that emphasis will be thrown on to the consistent producer and to illustrate in the first instance cows that show indications of being consistent lifetime producers and breeders.

Overseas work indicates that cows with lifetime production records are the soundest choice as breeding matrons, but their numbers are few, and an earlier identification of cows likely to possess the qualities sought after is desired. It is felt that qualification for the Intermediate Register of Merit will fill this need. It has been indicated that cows capable of qualifying for this Register are more likely to be successful breeders than single record cows.—
G. MCGILLIVRAY, Chief, Division of Dairying.

Cody Grain Sorghum Required for Production of Adhesives.

A SYDNEY firm is interested in the possibility of large-scale production of waxy grain sorghum, such as Cody, for use in production of adhesives. The Department has been informed that experiments carried out on samples of Cody starch received from the U.S.A. have shown that it is particularly satisfactory for this purpose.

It is stated that the wet milling process is much to be preferred to the dry process and as it is not possible to have any appreciable quantity milled by the former method in Australia, the firm proposes to erect a mill provided it can be assured of supplies of Cody grain sorghum.

Six acres of Cody have been sown at the Leeton Experiment Farm by the Department for seed purposes and for further testing by the firm in question.

There is no reason why the requirements of Cody grain sorghum cannot be supplied, provided a reasonable price is offered to growers. The present price of tapioca starch from Indonesia and arrowroot starch from Queensland is £70 per ton; this is 100 per cent. higher than in normal times.

Estimated requirements of the firm would be from two to three thousand tons annually.—DIVISION OF PLANT INDUSTRY.

Care of Yema Budded Vines.

WITH phylloxera-resistant vines, budded this season, it is suggested that growers keep the covering soil mound well above the bud, and loosen the soil should the mound set hard. Also remove some of the top growth of the stock should it be very long. If long and caught by the winds this growth is blown about and is responsible for producing an air hole around the stem of the stock which may be responsible for the drying-out of the scion bud.

In the early spring when the top of the stock is cut back do not cut less than two inches above the scion bud, as close cutting to the scion the first season will produce dead wood tissue immediately behind the union. The following season the stub above the union can be removed but not before.—H. L. MANUEL, Viticultural Expert.

Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd:—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Australasian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Bathurst Experiment Farm	46	29/6/49
Bradley, H. F., "Nardoo, Ashford Road, Inverell (Jerseys)	37	15/5/49
Cattell E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	121	14/7/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	17	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park" Mumbil (Beef Shorthorns)	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga" Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	49	8/5/49
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/12/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	103	7/5/49
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Riverina Welfare Farm, Yanco	55	6/12/49
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/48
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Baker, S. P., Myrtle Grove, Menangle	51	20/4/49
Barnardo Farm School, Mowbray Park	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, E. A., Four Mile Creek, Eeat Maitland	43	12/11/49
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/49
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell	42	17/3/50
Emu Plains Prison Farm	141	23/4/49
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/7/49
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/48
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H. Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	16	22/2/50
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	43	26/6/49
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McLane, R. G. P., Ibis Valley, Swanbrook	17	26/6/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B. "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Mullen, A. G., Goonoo Goonoo, via Tamworth	57	6/3/49
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Police Boys Club, Kurrajong	12	5/7/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell	22	14/5/49
Rolfe, C. D., "Rose Farm," Inverell	31	17/3/50
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/40
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	21	13/4/49
St. Michael's Orphanage, Baulkham Hills	29	11/6/49
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead	30	9/7/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	60	1/4/50
Tanner, F. S., Dural Rd., Armidale	42	8/10/49
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent. Armidale	5	25/2/50
Von Frankenberg, F. E. "Spring Hills," Camden	61	7/12/49
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5 7/49
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/49
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia ...	171	14/4/49

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area
Municipality of Muswellbrook
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief of Division of Animal Industry.

Hydatids in Humans.

Disease can be Contracted from Dogs.

HYDATIDS in human beings can result from inadvertent swallowing of eggs of the tapeworm that lives in dogs. On reaching the stomach the egg undergoes development, burrows through the wall of that organ and is carried to the liver, lungs or some other part of the body. It then grows into a slowly enlarging cyst—the bladder-worm stage of the tapeworm.

The method by which man most frequently becomes infected is by careless handling of dogs. The eggs are passed out in the dog's excreta and thus the dog's coat, and dust around its kennel, become grossly contaminated. Food should never be handled by humans unless the hands have been well washed beforehand, as the eggs may be transferred to the food and then swallowed. Flies may also carry the eggs on their feet, and dirty drinking water may be a further source of infection.

Dogs themselves can be infected by eating the hydatids frequently to be found in the viscera of sheep. In order to prevent infestation in dogs —and possibly, later, in humans—dogs should never be allowed to eat raw offal: a dangerous practice that is all too prevalent on many sheep stations.

Dogs should also be treated to remove tapeworms. The most satisfactory treatment is to administer to the animal concerned one-sixteenth of a grain of the drug, arecoline hydrobromide, per 10 lb. of its body-weight. The drug should be dissolved in water, the solution given as a drench. Purgation should occur about twenty to twenty-five minutes after drenching. If the dog is of any great size or is difficult to handle, he should be dosed by concealing tablets of the drug in a piece of his meat. When this method is followed, purgation should take place about an hour later.

The animal should be chained up immediately after treatment, in an area with a non-absorbent surface such as concrete; all subsequent droppings being carefully collected and burnt. Purgation after dosing must be sufficiently intense for the purpose, since the effect of the drug in causing the parasites to relax their grip on the mucous membrane of the animal's intestines is only temporary. If the purgation proves insufficient to remove them, it will be necessary to dose the dog again.—W. L. HINDMARSH, Chief, Division of Animal Industry.

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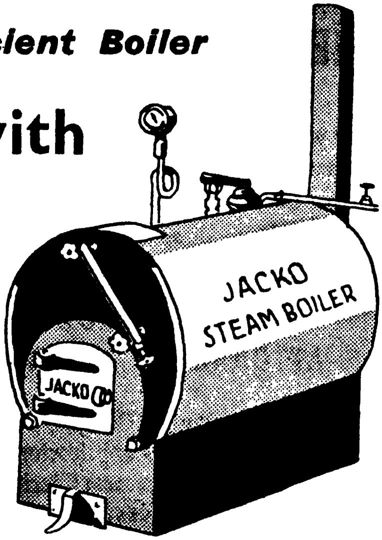

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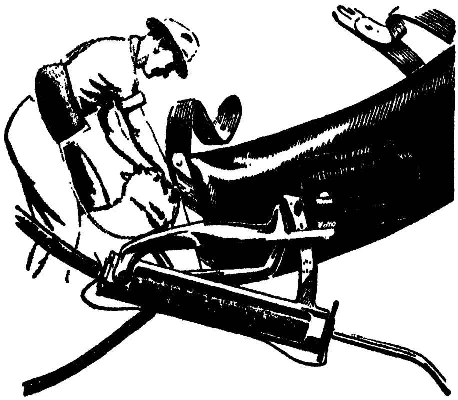

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Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	46
Cowra Experiment Farm (Ayrshires)	44
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., " Elwatan," Castle Hill (Jerseys)... ...	29
Evans, C. A. & Sons, " Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	173
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury, Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros. " Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., " Nundi," Tarcutta (Red Poll)... ...	62
MacPherson, I. F., " Bloomfield," Yass (Aberdeen-Angus)	26
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., " Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., " Jerseymead " Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	49
New England University College, Armidale (Jerseys) ..	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	103
Reid, D. B., " Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., " Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H. " Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., " Werribee," Waugoola (Aberdeen-Angus)	39
Rowntree, E. S., " Mourabee," Quirindi...	75
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	112
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	170
Wagga Agricultural College and Experiment Farm, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	23
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	92
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm...	54
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	8
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., " Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	28
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, " Abington," Armidale ..	69
Freudenstein, W. G. A. & F. J., " Chippendale," Grenfell Rd., Young	56
Gladesville Mental Hospital	7
Homer. A. T., Moorna Pastoral Co., Wentworth ..	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	34
Parramatta Mental Hospital	49
Peat & Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	13
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief of Division of Animal Industry.

Lime for Pastures.

Usually Applied in Autumn or Early Winter.

LIME cannot take the place of superphosphate in pasture improvement, but ground carbonate of lime (or some other finely-ground form) is a valuable supplement to that fertiliser.

Numerous instances have occurred in coastal areas where applications of lime in addition to superphosphate, as compared with superphosphate alone, have increased the carrying capacity of improved pastures by 100 per cent.

Lime not only promotes better pasture growth, but increases the vigour of clovers, improves soil texture and encourages the functions of useful bacteria. It also checks surface soil acidity, supplies free calcium to the plant, builds up animal bone and aids the functioning of some vitamins which contribute to the health of stock.

Whereas in most cases applications of lime or dolomite once every three years, at the rate of 2 tons or more per acre, can be expected to give optimum results, beneficial results can also be expected on many coastal and tableland pastures from applications of from ½ to 1 ton per acre.

Lime is generally applied during autumn or early winter, this period coinciding with renovation and top-dressing of coastal pastures with superphosphate.—DIVISION OF PLANT INDUSTRY.

A SAMPLE of water recently analysed by the Chemist's Branch of the Department of Agriculture, following a serious loss of sheep on a western district property, revealed that the salt concentration of the water had been increased by evaporation in a ground storage tank.

As a result of drinking this water 180 sheep died. The sample was found to contain over 2,000 grains per gallon of total salts—about twice the limit of salinity for sheep.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O. "Fairview," Camden.
Campbell, D. "Hillangrove," Wamberal, via Gosford.
Croft, F., Lugwardine, Kentucky.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B. Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Upston, H. E., Wattle Tree Road, Holgate, via Gosford.
Wagga Agricultural College and Experiment Station.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Water a Frequent Cause of Contamination of Cream.

FAULTS in milk and cream can frequently be traced to stagnant water. While the popular belief that drinking such water is, in itself, the cause of subsequent deterioration is unfounded, the fact remains that bacteria from such water often gain indirect entry to the milk. Mostly the cattle wade in a polluted swamp searching for water-couch, or they may even have to cross a stagnant creek in being driven to the milking yards. The body, including teats and udder, is fouled in this manner and the bacteria are later added to the milk while it is being drawn.

The biological quality of the water used for washing down the udder is also of importance. When cow after cow is washed with the same cloth and water from the same pail the water becomes more and more insanitary and a source of pollution to the milk. Sometimes the water is unsuitable at the outset, being taken from iron tanks in which manurial dust, blown from the yard to the roof and washed down the spouting, has been allowed to accumulate for months.—DAIRYING DIVISION.

Storage of Pumpkins Aided by Prior Curing.

PUMPKINS for storage should be selected preferably from early-sown crops as they have longer to ripen off than those from later crops.

The fruit should not be harvested until thoroughly ripe, as immature specimens tend to develop mould. Maturity is indicated when it is difficult to pierce the rind with the thumb-nail. The pumpkin should then be cut from the vine, leaving several inches of the stem attached to the fruit. Care should be taken to avoid bruising the skin, as injuries of any type permit entry by organisms, causing decay.

Prior to storing, pumpkins should be cured for two weeks. This can be done by placing the fruit in the sun, or in the cooler months, by placing it in the sun on an iron roof. The best curing temperature is 80-85 degrees.

Curing completes ripening and heals mechanical injury which may have occurred during harvesting.

Pumpkins free from frost injury should then be stored in a dry, airy place, preferably on slatted shelves, and they should be examined regularly for any signs of decay.—DIVISION OF PLANT INDUSTRY.

THE AGRICULTURAL GAZETTE FOR JUNE, 1949

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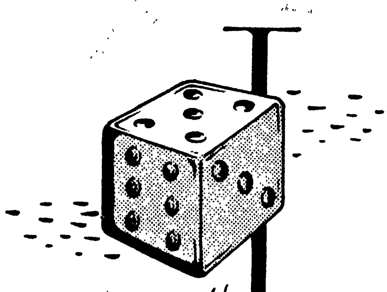

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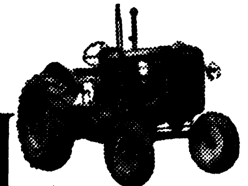

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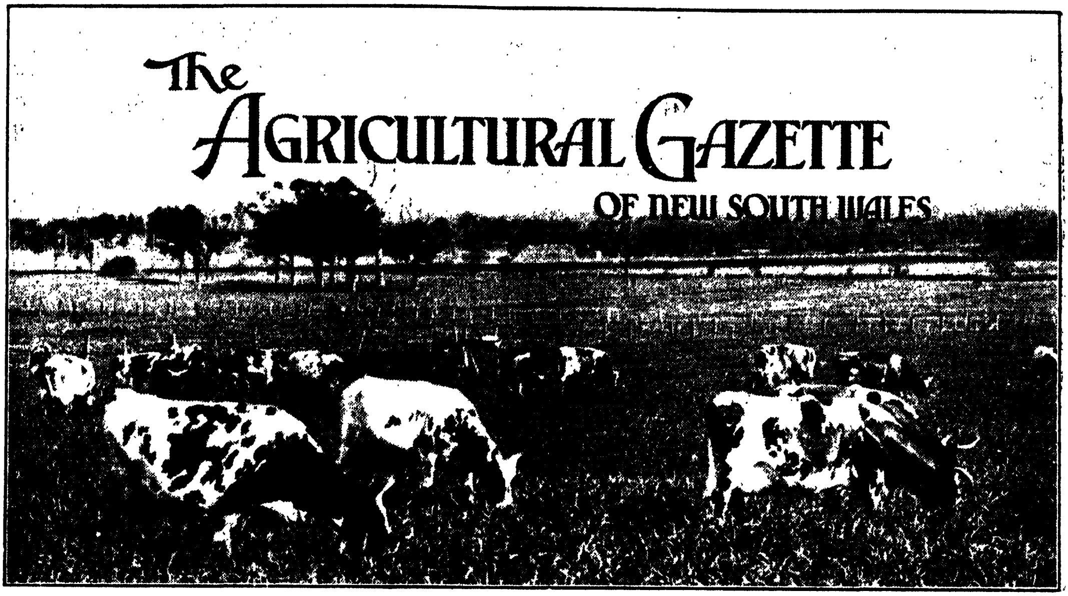


Editorial—

MAKE DAIRY PROSPERITY *Permanent*

THE dairying industry, like other primary industries, is experiencing a period of prosperity. Good seasons, fair prices and ready markets are the main contributing factors to this prosperity.

Demand on the home and oversea markets seems assured for some years. In fact, these markets are capable of further expansion; the home market, so far at any rate as butter and milk consumption is concerned, and the export market, particularly for milk products.

With stable, and most likely expanding, demand for primary products, prices could even fall a little and still leave the industries prosperous. There is, however, nothing to signify a material drop in prices of dairy products.

There seems only one factor which could, dairy farmers being willing, alter the present prosperous conditions and promising outlook. That is, a bad season, or run of bad seasons—which is inevitable sooner or later.

But droughty conditions can rob dairy farmers of prosperity only if they are willing; willing to do nothing about it *now*.

The wise farmer will make use of present circumstances to safeguard against any appreciable fall in production during the next dry season. He will do it now, when he has the surplus income to invest in such drought-proofing practices as fodder conservation, conservation of soil fertility and water, renovation of sod-bound pastures, eradication of rabbits, bracken and other weeds, culling of unprofitable cows, and perhaps to invest in a better bull, and clean up disease in his herd.

Those are some of the things which should be done now. And those are some of the things which Departments of Agriculture in all States are demonstrating to dairy farmers under the Commonwealth Dairy Grant Scheme.

In prosperous times it is difficult to get primary producers to think seriously of their likely plight when bad times return. In bad times, farmers are ready to agree on what is wanting, but shortage of capital often prevents putting into practice what they know to be necessary.

Capital is available now, with which to render the next droughty season largely ineffective, and so ensure permanent prosperity in the industry.

Better Facilities at Hawkesbury Agricultural College.

AT the 1949 Diploma Day function at Hawkesbury Agricultural College, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that the State Government was at present spending more than a quarter of a million pounds in additions to Hawkesbury College.

These included a new Dairy and Milk Processing Plant, costing about £120,000, a new Cannery, £30,000, and a new Dormitory, £80,000, to accommodate another eighty students. New bails for fifty pure-bred Jersey and Friesian cows, and a new Residence for the Deputy Principal would also be built.

Mr. Graham said the additions would greatly expand the scope of training available at that institution. Facilities had been severely overtaxed in recent years owing to the increasing demand for agricultural education by young men, including large numbers of Ex-servicemen.

The function marked the 57th Anniversary of Diploma Day at Hawkesbury College, which was founded in 1891. Since then over 1,400 students had obtained the Diploma in Agriculture and over 300 the Diploma in Dairying.

Altogether, more than 4,000 students had passed through Hawkesbury, 80 per cent. of whom were still associated with agriculture in some form or another.

Refresher Courses for Farmer Ex-servicemen.

THE following Courses in the principles of farm management, of eight weeks' duration, have been arranged by the Department of Agriculture at the Government Experiment Farm, Yanco:—

Number 11 Course—18th July, 1949, to 9th September, 1949.

Number 12 Course—19th September, 1949, to 11th November, 1949.

Application from the holders of Qualification Certificates under War Service Land Settlement should be made to the Deputy Co-ordinator Rural Training, Department of Agriculture, Box 36A, G.P.O., Sydney.

Course Number 11 is filling rapidly, and applications are in hand for Number 12, which will be the last held this year.

Bean Seed Certification.

FINAL inspection of bean seed crops submitted for certification by the Department of Agriculture has now been completed.

Altogether 859 acres of beans were inspected, of which 571 were adjudged to be of certified standard.

The acreage certified includes Brown Beauty 430 acres, Hawkesbury Wonder 99 acres, Wellington Wonder 18 acres and Tweed Wonder 14 acres. Small areas of Landreth, New Zealand Stringless and Refugee were also passed for certification.

Although it is too early to predict accurately the quantity of seed that will be available, present indications are that approximately 5,500 bushels of merchantable seed will be harvested.

Breach of Farm Produce Agents Act.

ANOTHER prosecution launched recently by the Department of Agriculture against an Agent Company operating at the City Markets for a breach of the Farm Produce Agents Act was heard at Central Police Court recently. The Agent Company was convicted and fined.

Commenting on this fact the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that the Company dumped twenty-two cases of bananas received from a North Coast grower without having sought or obtained a Condemnation Certificate.

"As a safeguard to growers' interests," continued Mr. Graham, "agents at the City Markets are required to comply with the provisions of section 19 of the Farm Produce Agents Act, which prescribes that before produce is dumped a written direction or authority is necessary.

"No doubt, this latest conviction will serve as a further warning to agents that they must conform with the terms of the Farm Produce Agents Act and Regulations," added the Minister. "Fruit and vegetable growers can rest assured that my Department will continue to maintain strict supervision over operations at the City Markets and where any irregularities come under notice legal proceedings will be instituted."

THE GROWING OF LINSEED

Made Possible by Disease-resistant Varieties and Effective Pest Control

W. M. CURTEIS, B.A., B.Sc.Agr., Special Agronomist.

SEVERAL attempts have been made in the past to establish linseed growing in Australia. In general, they have failed because of unsuitable varieties, insect pests, and disease. However, the introduction by the New South Wales Department of Agriculture, of disease-resistant varieties, and the development of effective means of pest control, have combined to make linseed growing a favourable enterprise at the present time. The most suitable of these introduced varieties is the American linseed, Walsh, which is the only variety now being grown commercially. It has a large seed of high oil content, and is resistant to rust in New South Wales.

To supply Australia's present requirements of linseed, it would be necessary to sow about 500,000 acres. In Australia 20,000 acres were sown during last season, of which 8,000 acres were in New South Wales. The total acreage last season was grown under contract to linseed-crushing firms.

Linseed oil is one of the chief components of paints, varnishes and linoleum, and has many other industrial uses. The presscake or meal, which remains after the oil has been extracted from the ground and partly-cooked seed, is a valuable stock food.

Linseed is botanically identical with flax, but linseed varieties have been specially selected for high seed yield, whilst flax varieties are specialised for fibre. To avoid confusion, particularly in districts where both crops may be grown, it is convenient to apply the name "linseed" to the crop grown for grain, and to the resultant grain; "flax" should be confined to the crop grown for fibre and its seed should be called "flax-seed." It is true that fibre, of inferior quality, may be obtained from a linseed crop, and flax-seed may be used for oil production, but either crop is an unsatisfactory substitute for the other.

Climatic and Soil Requirements.

Linseed requires a good and well-distributed rainfall or irrigation during the period April to October. As in the case of wheat, the distribution of the rainfall is as important as its actual amount. After germination the most critical period is about September, when linseed flowers; unless

Harvesting Linseed with a Header.

good winter rains have fallen, to carry the crop through, lack of sufficient moisture at this stage is likely to have an even more serious effect on yield than in the case of wheat. It follows that linseed should be confined to the more favoured wheat districts, or to irrigable areas.

Relatively dry conditions are essential during the harvesting period in December, or difficulty may be experienced in harvesting, due to the persistent toughness of the stems, to the prolonged flowering and secondary growth which may occur as a result of continued rainfall.

When linseed plants are established they are at least as frost-hardy as wheat, but cold weather retards their growth. Late frosts at flowering time can cause severe losses by killing the young flowering buds. On the tablelands linseed should be sown in late winter or early spring. Linseed also possesses good drought resistance, but must have favourable conditions to yield well.

The crop can be grown on a very wide range of soil types. Generally, any soil which will yield good crops of wheat or oats in a normal season can be regarded as suitable; however, linseed does best on the heavier soils and these should be selected in preference to light red loams.

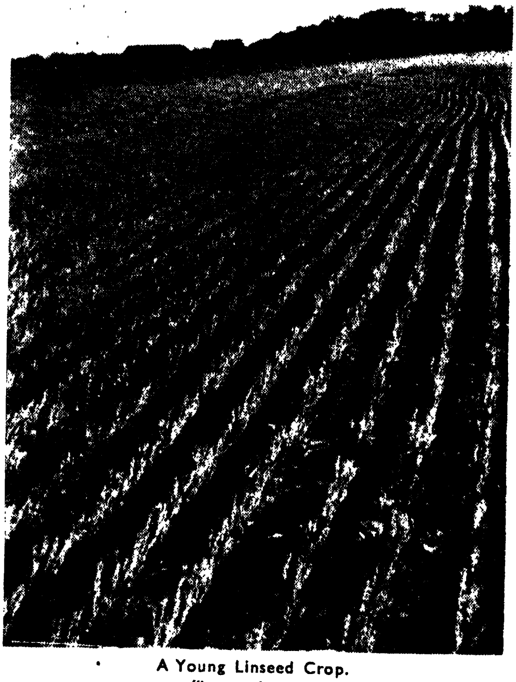
Preparation of Land.

Land intended for linseed should be worked as for wheat or oats, but the final preparation should be designed to produce a finer and firmer seed-bed to suit the smaller seed. It is most desirable that this seedbed should be firm, moist enough near the surface to ensure good germination of shallowly-drilled seed, and particularly free of weed seeds. These requirements are generally fulfilled only in fallowed ground, and extra cultivation is usually necessary.

As linseed cannot compete against weed growth particular attention should be given to ensure that the land is free of weeds. Weeds, besides smothering portion of the crop, are apt to prove a nuisance at harvesting as well as causing impurities in the grain harvested which is subject to heavy price dockage.

Time of Sowing.

Experiments have shown mid-April to mid-May to be the best sowing period in most districts. Earlier sowing than this may result in premature flowering and possibly damage by frost, whilst later sowing does not allow the plants to make vigorous growth before being retarded by cold weather. The success of the crop depends largely upon the amount of stooling and growth made in autumn, as flowering commences in spring more or less independently of the height of the plants. Late sowing retards flowering to some extent, and the crop is then more liable to damage by caterpillars, because the latter breed rapidly under warmer conditions. On the tablelands a late sowing in July or August is recommended.



A Young Linseed Crop.
Ten weeks old.

Rate of Sowing.

Half a bushel (28 lb.) of seed per acre is recommended as the best general sowing rate in the north-west of New South Wales, whereas in the southern districts and Riverina heavier sowings up to 40 lb. per acre are recommended; under irrigation 40 lb. of seed per acre is considered necessary.

Trials must be made with individual drills to determine the gears required to sow linseed at a given rate. It will be found that

drills using a drum-feed will usually sow linseed at a slightly higher rate, about 10 per cent heavier, than wheat. Seed should be sown through all tynes of the drill, using the fine side of the seed plates up. Light harrows should follow the drill to cover the seed, and sometimes a light rolling is necessary to ensure a firm seed-bed.

Depth of Sowing.

Owing to its structure, the linseed seedling has greater difficulty in emerging from the soil than cereal seedlings; particular care should, therefore, be taken not to sow the small seed deeper than is necessary to ensure an adequate supply of moisture for germination. A depth of approximately 1 inch to 1½ inches is recommended, but the actual depth will vary with the preparation of the seed-bed, the depth of the surface mulch and the nature of the soil.

Fertilisers.

Superphosphate at the rate of ½ to 1 cwt. per acre, drilled in with the seed, is recommended in districts where the application of this fertiliser to wheat is standard practice.

Linseed Under Irrigation.

The elimination of weed seeds and thorough preparation of the seed-bed should receive no less attention under irrigable conditions than the "dry" areas. The availability of water, however, offers greater latitude with respect to the actual time at which the necessary operations are performed, and the very best sowing time can be chosen deliberately.

In addition to the other operations, land intended for irrigation should be carefully graded, and check-banks similar to those used for lucerne or pastures should be built at half to one chain intervals, allowing a fall of 1 foot in a length of 10 to 20 chains, depending on the nature of the soil, from the head-ditch. The bays themselves should be very carefully graded, between the check-banks, to smooth out bumps and hollows and allow even watering. Like lucerne, linseed scalds rather easily if left standing in water for any length of time.

It is usual to irrigate the fallow, or the bays, prior to sowing, to ensure adequate moisture for germination, but with a normal rainfall, irrigation should not be necessary during winter. If the early spring months are dry, water should be applied as soon as it becomes available, and irrigation continued periodically up to the flowering stage.

Linseed requires rapid, light waterings rather than prolonged soakings, and the total amount of water used, including watering of the fallow, should not exceed 2 acre-feet in normal circumstances. The time allowed between irrigations will depend upon seasonal conditions and the nature of the soil. A safe guide is to give as little water as possible consistent with maintaining growth and preventing the deep cracking which is apt to occur in heavy soils. Usually one or two irrigations are sufficient, and rarely more than four are necessary, even in a very dry season.

No water should be applied after normal flowering ceases, if it can possibly be avoided. The only valid exception to this rule is the case mentioned above of a heavy soil cracking deeply, with injury to the roots, before ripening has commenced.

With spray irrigation, of course, no grading and banking is necessary, but the principles of watering are similar.

Harvesting.

Under normal conditions the linseed crop will be ripe and ready to harvest in late November or early in December in the north-west, and late December or early January in the Riverina districts. The crop is ready to harvest when the entire plant is dry, brittle and yellow-brown in colour, with the seeds audibly rattling in the bolls. Linseed rarely lodges, and even if plants are blown over before maturity they show a remarkable ability to stand erect again.

Wheat or rice headers can be adapted readily for linseed harvesting. The standard bar-drum is preferable to the rice peg-drum, but either should be so adjusted in speed and clearance that it just breaks the bolls completely without injuring the seed, and in this respect a bar-drum is easier to adjust. An oat riddle, if used, should be set more nearly horizontal than normal and with the lips facing back.

The fan speed or air inlet should be regulated to sort the material effectively without blowing seed out. All cracks and crevices in the machine must be stopped or considerable losses will occur. The knives must be in good condition and well adjusted to the

ledger plates, as linseed is a tough cutting crop. If the knives tend to gum up, they should be washed with water.

Some growers take the crop off in the rough, and then, after harvesting, put the seed back through the header in a stationary position. By this method they obtain a clean sample and do not waste any seed by blowing. As the market price of linseed depends directly upon its cleanness as well as quality, strict attention should be given to producing clean seed. Dockages are made for impurities, and if the seed is very dirty, oil-crushing firms will not take delivery unless the seed is recleaned on the farm.

If late rains induce secondary growth in the crop, or if a considerable proportion of green weed growth is present, the crop should be cut with the binder and threshed out of the stook or stack. It is also feasible to windrow with the binder or mower and pick up with the header when the crop has dried out. The binding, stooking, and stationary threshing method results in a particularly good, clean sample, as the linseed conditions well and threshes very readily and completely.

Yields.

A normal yield that can be anticipated in the good wheat areas is about 10 bushels per acre. A fair assumption is that linseed will yield about one-third to half as much as wheat under similar and favourable conditions. Under irrigation higher yields can be anticipated.

The best yield obtained to date under natural rainfall conditions is 22 bushels per acre. A bushel of linseed weighs 56 lb.

Marketing.

The price of linseed is normally fixed by world parity, which is based chiefly upon the supplies available from Argentina and India. The oil content and cleanness of the seed are very strictly defined by world markets and deductions are made for any deviations from the standards. The oil standard in Australia is 40 per cent., and adjustments are made for all differences over and under this standard. Dockage charges are also made for all impurities.

Linseed Straw.

Linseed stubble has no value as a stock feed. It is generally burned off before the land is utilised for the succeeding crop. In America linseed straw is utilised for its fibre in the manufacture of cigarette paper and other articles, but to date no attempt has been made to utilise linseed straw in Australia.

Ground Dusting with DDT for Heliothis Control.

Pests and Diseases.

The chief insect pest which attacks linseed is the caterpillar of a moth, *Heliothis armigera,* variously known as the tomato grub, the corn ear-worm, the cotton boll-worm and the lucerne seed caterpillar. This pest bores into the immature linseed bolls and eats out the seed; it can cause very severe loss if present in sufficient numbers.

It appears necessary to take precautionary measures against *Heliothis* on all linseed crops. An effective and economical control can be obtained by dusting with 5 per cent. DDT at the rate of 15 to 20 lb. per acre. In some districts, especially where the infestation is late, more than one dusting may

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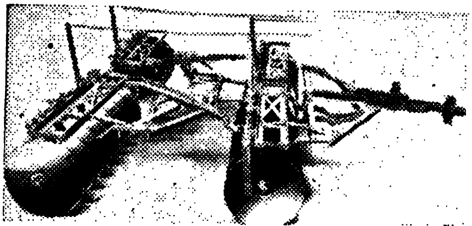

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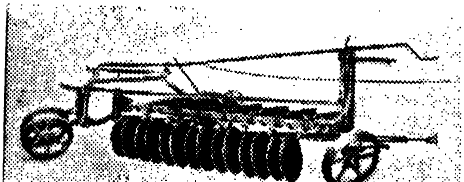

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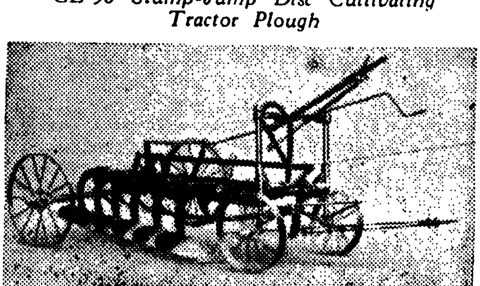

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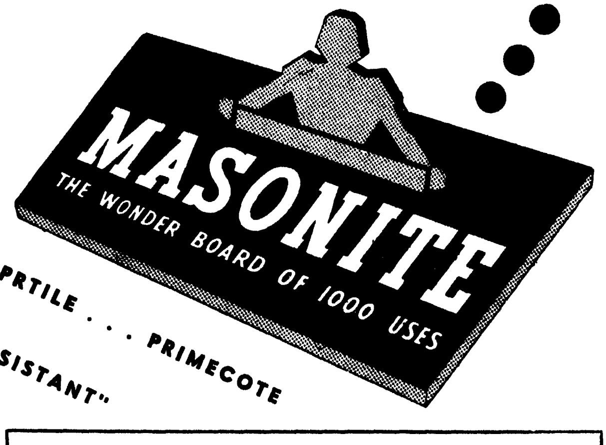

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be required, but usually good control is obtained by a single dusting just after the young bolls have formed.

Dusting is done either with a Y-2 power duster fitted behind a motor truck or by aeroplane. In using a Y-2 duster, it is recommended that a sheet be used in order to get proper penetration of the dust into the crop. As in the dusting of all crops, calm weather is required for effective control and this is particularly the case with aeroplane dusting.

Rust (*Melampsora lini*) was the most serious disease of linseed in the past, but Walsh has proved entirely resistant to rust in New South Wales during thirteen years of testing, even when grown next to severely infected varieties. In Victoria and Western Australia rust has been reported on Walsh linseed.

Pasmo (*Septoria linicola*) was reported last year in the southern districts of New South Wales and this disease is also known to occur throughout Victoria. To date no serious loss has been reported from this disease.

All other diseases of linseed known overseas are either very rare or quite unknown under local conditions.

State Wheat Committee—Government Nominees Appointed.

THE names of the Government nominees on the State Wheat Committee have been announced by the Minister for Agriculture, Hon. E. H. Graham, M.L.A. They are Messrs. A. H. E. McDonald, L. S. Harrison and D. J. Howse. Mr. Graham said that Mr. McDonald would be the Chairman of the Committee.

Mr. Graham said that Mr. McDonald was recognised as one of the foremost wheat authorities in the State. Formerly he had been Chief of the Division of Plant Industry in the New South Wales Department of Agriculture, in which capacity he had rendered invaluable service to wheat growers. Mr. McDonald had been chairman of the Special Wheat Committee set up to handle last year's harvest.

Mr. L. S. Harrison, the second Government nominee, was well known among the New South Wales wheat growers as Wheat Commissioner and Manager of the Government Grain Elevators, said Mr. Graham. His knowledge of the handling of the State's wheat harvest would be of great assistance to the Committee.

The third Government nominee, Mr. D. J. Howse, Chief Traffic Manager of the New South Wales Government Railways, would be able to contribute valuable advice from his years of experience in wheat transport problems.

Representatives on the Australian Wheat Board.

Mr. Graham has also announced the names of the two wheatgrowers elected as New South Wales representatives on the Australian Wheat Board. They are Mr. R. A. O'Neill, of Myall Plains, Berrigan, and Mr. R. J. S. Doolin, of Myall Downs, North Star.

"I congratulate Messrs. O'Neill and Doolin on their election to such important positions," said Mr. Graham. "They are both well qualified to represent the wheatgrowers of New South Wales on the Australian Wheat Board, and no better choice could have been made in the interests of growers and the wheat industry generally."

Messrs. O'Neill and Doolin were two of the four wheatgrowers recently elected at a State-wide ballot of growers to the State Wheat Committee set up under the New South Wales Wheat Industry Stabilisation Act, 1948.

Licensing of Potato Growers.

IT has come to the notice of the Department that there are still a number of potato growers who have not obtained a license for the current year of their operations, as required by the Potato Growers' Licensing Act, 1940.

Commenting on this fact, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.), stated that, under the Act, any person who uses an area of land in excess of one acre or areas of land totalling more than one acre, for the production of potatoes, must obtain a license for which a fee of 10s. is payable. A license remains in force for a period of twelve months from date of issue, and must then be renewed if the grower continues to use an area of more than one acre for the production of potatoes.

Mr. Graham pointed out that the proceeds from the licensing fees were used for purposes associated with the development and protection of the potato growing industry and, therefore, it was in growers' own interests to pay license fees when due.

Application form for a license or for renewal of a license, can be obtained from the Under Secretary and Director, Box 36, G.P.O., Sydney.

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albury Sheep Show (A. G. Young) ...... July 19, 20, 21
Condobolin ...... August, 9, 10
Trundle ...... August 16, 17
Bedgerabong ...... August 20
Peak Hill ...... August 26, 27
Wagga Wagga (G. O. Dewey) . August 23, 24. 25
Parkes ...... August 29, 30, 31
Grenfell ...... September 2, 3
Young (T. A. Tester) ...... September 6, 7
Forbes ...... September 9, 10
Cowra ...... September 13, 14
The Rock (O. L. Boyd and A. F. Walker) ...... September 17
Canowindra ...... September 20, 21
Eugowra ...... September 27, 28
Albury (A. G. Young) ...... October 11, 12, 13
Kyogle ...... October 12, 13
Lismore (North Coast National) October 19, 20, 21, 22
Alstonville ...... October 27, 28
Murwillumbah ...... November 2, 3
Mullumbimby ...... November 9, 10
Bangalow ...... November 16, 17
Nimbin ...... November 24, 25

1950.

Newcastle (P. G. Legoe) February 22, 23, 24, 25
Gundagai (J. C. Sattler) ...... March 7, 8

Approved Vegetable Seed, June, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear that number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Varieties Listed—*continued.*

Cauliflower—

All Year Round (E.S. 47/10)—E. A. Sharp. 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd.. Dee Why Parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Pearson (Moscow) (H.R. 47/6 and H.R. 48/1)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 47/2)—H. P. Richards, "Sovereignton," Tenterfield.

THE *Agricultural Gazette* is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.

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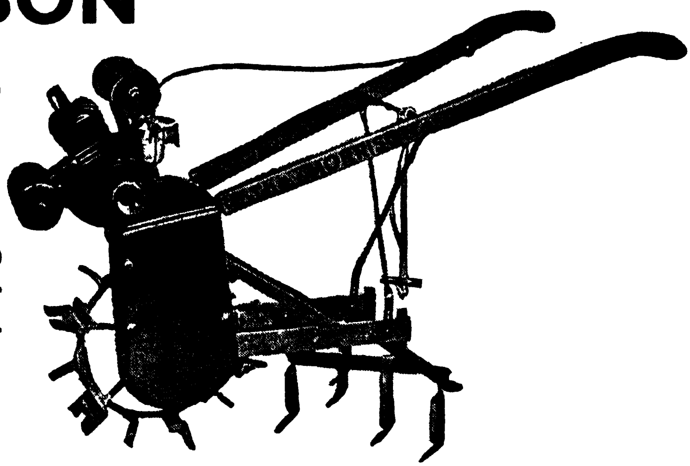

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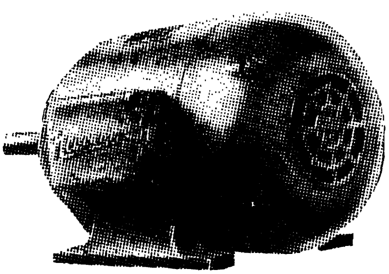

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AGRICULTURAL BUREAU NEWS

THE UPPER HUNTER CONFERENCE

Good Gathering at Singleton

YET another annual divisional conference of the Agricultural Bureau of New South Wales was successfully staged last month. Some eighty delegates and members assembled in the Showground pavilion at Singleton on 5th May to take part in a programme of addresses and discussions on subjects of interest to primary producers of the Upper Hunter area.

The conference was officially opened by Mr. J. R. Somers, State General President of the Agricultural Bureau, and the principal speakers included Messrs. M. Buttsworth and W. H. Bruce, members of the Rural Bank Progressive Farmer Team which recently visited America and Britain, who spoke of the conditions in the dairying and poultry industries respectively in those countries; Mr. A. L. Harnett, Advisory Councillor of the Agricultural Bureau, who described the benefits of co-operation and the working of co-operative societies; and Mr. M. Sawtell, who discussed the possibilities of the development of inland Australia by the conservation of water. The evening session was addressed by Sir James Bisset, who was commander of the "Queen Elizabeth" during the war years.

The Official Opening by Mr. Somers.

In opening the conference, Mr. Somers said he had already, this year, attended divisional conferences at Dalgety, Orange, Wyong, Neurea and Woodstock—and at these gatherings the Bureau had presented well balanced educational programmes which had been well received by enthusiastic audiences. This was not only evidence of the good work of the organisation, but indicated that primary producers were making use of the Bureau.

Stressing the importance of increased production, Mr. Somers said that the "surface had only been scratched" so far as the productive capacity of this land was concerned. Dairy farmers should aim at increasing production by the establishment

Agricultural Bureau Officials at Singleton Conference.

Left to Right.—Messrs. A. F. and K. B. Munzenberger, Hon. Secretary and District President, respectively; Mr. A. L. Harnett, Divisional Advisory Councillor; Mr. J. R. Somers, State General President; and Mr. J. Slater, Bureau Organiser.

of more irrigation schemes and by pressing for the payment of a price commensurate with production costs.

Impressions of Overseas Dairying.

Mr. M. Buttsworth who recently returned from a visit to America and Great Britain as a member of the Rural Bank Progressive Farmer Team, said that he had been impressed during his trip by the great help and courtesy given to the team by extension service officers in the countries visited.

He had observed growing interest in the cross-breeding of cattle and in artificial insemination. In United States of America 90 per cent. of cattle were now dehorned, while herd recording was regarded as of great importance, nearly 20 per cent. of cattle being under test.

Milk was put up in a variety of ways in United States of America. For example, while Grade A milk was sold in non-returnable cartons and contained 3.4 per cent. fat, it was possible to buy 5 per cent. milk and also various grades of cream and milk with added vitamin D, etc. The consumption of ice cream in United States of America was 28 quarts per person per year.

Much more attention was given to feeding in United States of America than in this country, said Mr. Buttsworth. Very good pastures were well managed, much hay was made and every farm has a tower silo.

In England most dairy farms were "mixed" farms, and used rotations of up to five years, with pasture for periods of two to three years. Much use was made of farmyard manure.

Poultry Farming in Other Lands.

Mr. W. H. Bruce, also a member of the Progressive Farmer Team, addressing the conference on poultry farming in other lands, said that one of the lessons he had learned from his trip was that the countries visited, with the exception of the United Kingdom, had areas of land as poor as any in Australia. No country visited had the possibilities that existed in Australia. What was needed here was more economic use of the land at our disposal.

The poultry farming industry in Australia, said Mr. Bruce, had grown without planning—just like Topsy. It has expanded considerably in recent years and had been greatly disturbed by the war. It was now exporting at pre-war prices, and, in common with other primary industries, needed to put its house in order.

In United States of America, poultry farming was carried on under better conditions than in Australia and consumption of poultry products was four times greater than in Australia. Poultry was the cheapest meat in United States of America. In that country, as a rule, breakfast was the only meal cooked in the home, and this accounted for the high egg consumption.

Poultry farming was carried on more economically in the United States than here. Stock was raised under free range conditions to save the cost of yards, houses, etc. Mobile houses were in common use; these were valuable in providing a rotation of areas and in manure distribution. Wire floors and sides were used in houses and 200 birds were raised in a house which, in Australia, would hold only 100 birds. Dry mash was used exclusively, being put up by co-operative organisations which were producer-owned.

Mr. Bruce described one plant which consisted of a five-storey concrete building housing 8,000 laying hens, which was managed by one man. This building in which the replacement chickens were also raised was equipped with electric light, an electric lift and a hot water system, the pipes of which were used as reinforcement in the building.

Other Conference Items.

During the afternoon session a visit was paid to "Minimbah", A.I.M. Training College for Aborigines, a few miles out of Singleton, and a special women's session was addressed by Miss Nancy Foskett, Senior Extension Officer of the Department of Agriculture, whose subject was "How to Use a Commercial Pattern."

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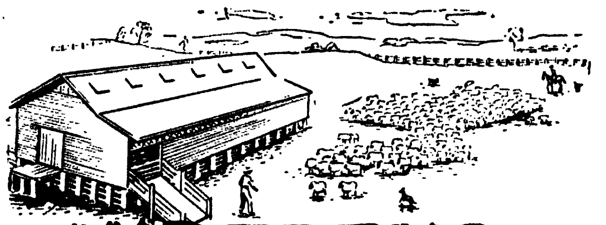

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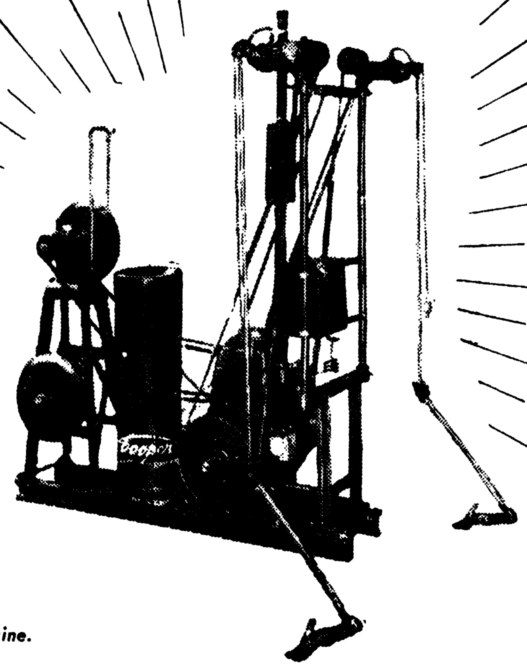

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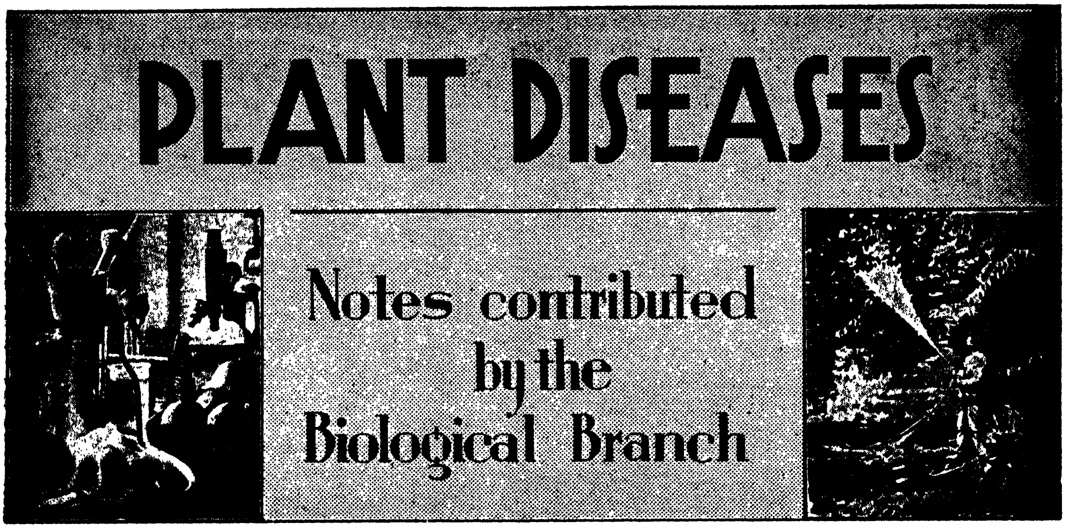


PASMO DISEASE OF LINSEED

F. C. Butler, B.Sc.Agr., Assistant Plant Pathologist.

PASMO disease of linseed and flax, caused by the parasitic fungus *Septoria linicola* (*Sphaerella linorum*) was recorded for the first time in New South Wales in November, 1948. It was identified in a number of crops of the linseed variety, Walsh, growing in the Walla Walla district in the southern portion of the State. The outbreak was reported to be general throughout this district and specimens forwarded for examination showed moderately severe leaf, stem and boll infections. The disease was not reported elsewhere in the State where, for the most part, linseed crops were remarkably free from disease of a parasitic nature.

Pasmo is a seed-borne disease of a highly infectious nature, and under conditions of high humidity and frequent rainfall it is capable of spreading rapidly. First described from the Argentine by Spegazzini[2] in 1911, it has since established itself throughout the majority, if not all, the flax- and linseed-growing areas of the world.

Although the Walla Walla outbreak represents the first recorded occurrence of Pasmo in New South Wales, the disease has been known in Victoria since 1940, when it was identified on flax grown from imported seed of Canadian origin[1].

The New South Wales outbreak last season occurred in crops grown from a bulk seed supply not known to be Pasmo-infected. Similar seed to that sown at Walla Walla did not give rise to Pasmo-infected crops elsewhere in the State. Circumstantial evidence, therefore, suggests that the disease was brought in by wind-borne spores from Victoria.

Economic Importance.

Overseas experience has shown that, under conditions which favour its development, Pasmo can cause severe blighting of flax and linseed crops with resultant substantial losses in fibre and seed yields, respectively. Frequently, however, the disease does not develop to any extent until late in the season, in which case losses are usually not serious.

Pasmo is most severe on flax and linseed in the seedling and after-flowering stages. During the intermediate stages of growth the plants appear to be temporarily resistant to attack.

Symptoms.

In the seedling stage, infection is confined to the cotyledons and young leaves, which develop pale-coloured circular-shaped lesions. Later, these lesions enlarge, becomes greyish or brown in colour, and may assume a more irregular outline. The

lesions also become studded with small, black bodies which represent the fruiting bodies of the causal fungus. Stem infection is seldom, if ever, observed in the seedling stage.

While seedling infection does occur, the disease usually becomes most evident in the field a short time before harvesting. The most striking symptoms of infection at this stage are a pronounced blighting of affected plants and the occurrence, at intervals, of conspicuous brown stem lesions (see illustration). These lesions, which usually vary from ¼ to ½ inch in length, and may ultimately encircle the stem, develop first in the lower stem regions and extend upwards.

Pasmo Disease.

Portions of two flax plants showing characteristic Pasmo symptoms on stem and leaves. Note dark, circular to irregular-shaped lesions on leaves and elongated stem lesions on plant at left.

[*After Brentzel.*

In the early stages of development they are small, rather elongated, and extend only part of the way round the stem. Due to the alternating brown lesions and healthy green or yellowing tissue, the stems of infected plants have a characteristic mottled appearance.

Numerous lesions also develop on the leaves (see illustration). Under favourable conditions these lesions coalesce and the entire leaf is rapidly killed. Leaves so affected become dry, curl up, and often fall to the ground. Lesions on mature or semi-mature stems and leaves also develop the small black fruiting bodies of the causal fungus. It is from these fruiting structures that the spores responsible for secondary infection in the crop originate.

In the case of severe attack, flower buds and bolls are also blighted and many bolls either fail to set seed or produce only small, shrivelled seeds. Sometimes the disease develops late in the season and, even though the plants are covered with lesions at harvest time, the yield is not materially reduced.

In general, Pasmo-affected crops are characterised by the occurrence of scattered brown areas. With suitable conditions for the spread of the disease, these areas enlarge and may eventually involve a considerable portion of the field. Though the plants on the outer perimeter of such areas may be only slightly affected, the disease becomes progressively more severe towards the centre, where many plants are completely defoliated and show brown, dry stems.

Sources of Infection

Primary infection with Pasmo may result from a number of sources. It is a seed-borne disease and seed from an infected crop should never be retained for sowing purposes. Moreover, it can also live over in infected straw from a previous crop. In addition to these sources of infection, it may also be carried over from season to season on infected volunteer flax or linseed plants, or on wild flax (*Linum marginale*).

Control Measures.

Because Pasmo is seed-borne, only seed obtained from areas where the disease is not known to occur, should be sown. Seed dusting with an organic mercury compound should be carried out as a routine measure, but it should be noted that seed treatment is only partially effective in controlling the disease if infected seed is used. Hence the necessity for sowing disease-free seed.

As soon as possible after harvest, infected stubble should be burnt and the residue ploughed in. It is advisable also to practise a system of crop rotation and strictly avoid sowing infected land to linseed or flax in successive seasons.

Wild flax and volunteer linseed and flax plants should also be destroyed where practicable as they may serve to carry the disease over from one season to another.

References.

[1] MILLIKAN, C. R.—*Vic. Jour. Agric.* 46: 2: 90-92, 96; 1948.
[2] SPEGAZZINI, C.—*An. Mus. Nac. Buenos Aires* (III) 13: 389-390; 1911.

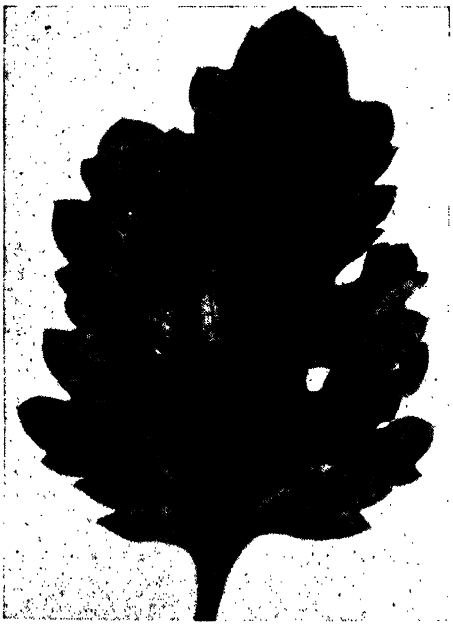
Leaf Nematode of Chrysanthemums

THE leaf nematode (*Aphelenchoides ritzema-bosi*) has been extremely destructive to chrysanthemum crops in New South Wales during the past three years.

Though the available varieties of chrysanthemums include a number which are almost completely resistant to this parasite, many popular florists' types are so susceptible that the flowers can be completely spoiled in a bad season. Damage is greatest following periods of humid or showery weather.

The parasite is a minute, worm-like organism which feeds and multiplies within the leaf tissue. Infection is spread by the worms moving up the stem on the outside to new leaves as they are formed, or being splashed by rain to adjacent plants. New offsets become infected in the autumn and the disease is spread to new areas by their use.

The early or mild symptoms are easily confused with those of leaf spot (caused by the fungus *Septoria chrysanthemella*). Leaf spot lesions are mostly roughly circular,



Leaf Eelworm.

Large, angular dead areas caused by leaf eelworm infection. Some yellowing of adjacent tissue is often seen.

A Chrysanthemum Plant Badly Affected with Leaf Eelworm.

Showing withered, hanging leaves.

whereas nematode lesions tend to be triangular, bordered by main veins on two sides, but this is not invariable.

In a severe attack of leaf nematode the lower leaves are entirely blackened and hang withered against the stem. The disease progresses upward and all leaves may be involved by the time the flowers open and, in bad cases, the flower also is browned and decayed, often at one side.

New Insecticide Shows Promise for Control.

So far there has been no satisfactory control method which can be recommended for use on a commercial scale. It is of interest, therefore, to record the result of a small trial in which two of the new organic phosphate insecticides—E605 (Diethyl-paranitrophenyl thiosphosphate) and HETP (Hexaethyl tetraphosphate) were used as foliage sprays. Each was applied at a strength of 1 part emulsion to 800 parts water to twelve well-grown heavily infected plants.

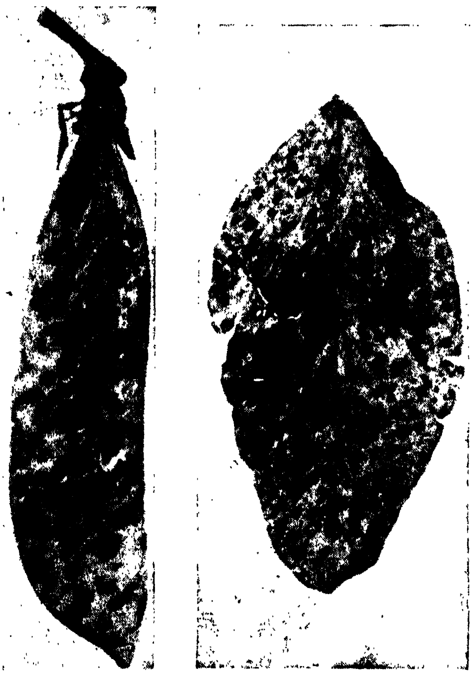
HETP had no effect on the viability of the nematodes within the leaves. A single application of E605, however, resulted in the death of the nematodes and their eggs within existing lesions without apparent damage to the plants, and no further extension of the disease took place.

These results are sufficiently encouraging to warrant field scale trials next season.

Diseases of Peas Carried in the Seed

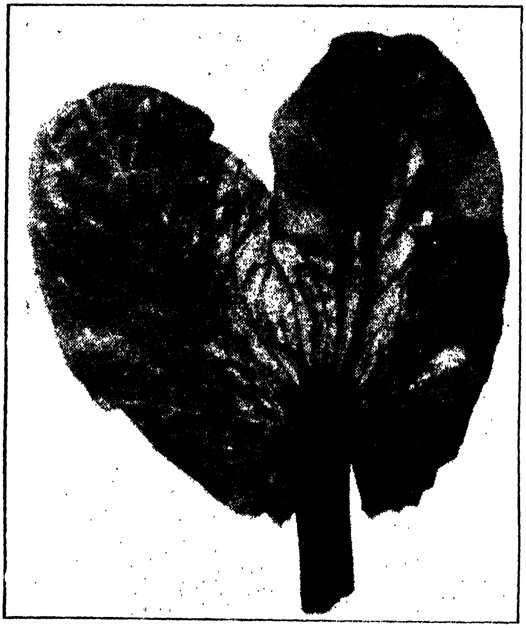
PEAS are subject to several diseases caused by parasitic fungi and bacteria. In any particular crop, the infection usually originates from one or more of the following three sources:—(*a*) seed, (*b*) soil and (*c*) neighbouring crops.

In the case of diseases such as Fusarium wilt, the soil is the source of almost all the infection, although these diseases may be introduced in the first place by means of seed into land not previously infested. Diseases such as powdery mildew and downy mildew are easily disseminated by wind and the usual source of infection for any particular crop is some other crop in the neighbourhood.



Mycosphaerella Blight, showing the Typical Spotting of Pod and Leaflet.

Blackening of the base of the stem, or foot-rot, is also a sign of blight.



Bacterial Stem Blight of Peas.

Watery bruised areas on the stipules and dark green areas on the stem distinguish stem blight from other pea diseases.

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Shell Aphis Oil should be used at the rate of 2½ gallons in 100 gallons of spray mixture, that is, a dilution of 1 part in 40 parts of water by volume. The diluted mixture should be thoroughly sprayed over the trees in the late dormant period.

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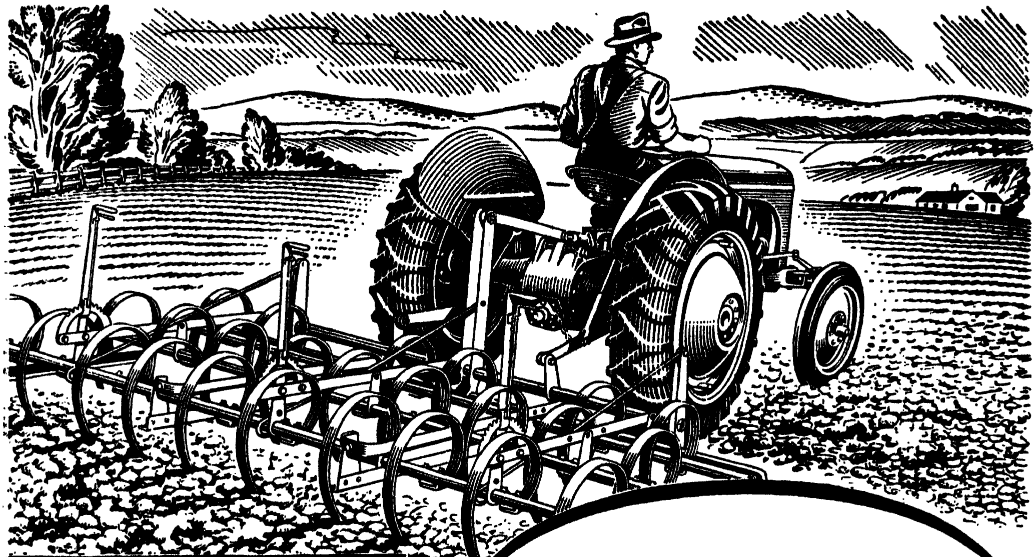

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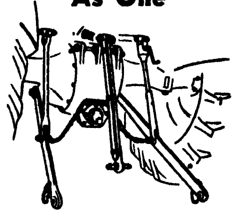

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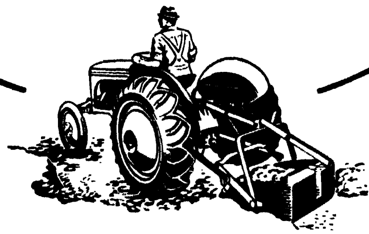

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In the case of bacterial blight, the Mycosphaerella blight and Ascochyta leaf spot, infected seed is the usual source of the disease, although infection does sometimes occur from adjacent crops or, per medium of the soil, from a diseased crop grown during the preceding year in the same land. However, it has been found that the severity of these diseases is usually connected, firstly, with the amount of disease carried in the seed and secondly, with the weather conditions experienced during the growth of the crop. Wet conditions during the growth of the crop favour the spread of the diseases, whereas, under very dry conditions, they may not be evident despite the fact that diseased seed was planted.

No seed treatment is known which is really effective in eliminating bacterial blight, Mycosphaerella blight and Ascochyta leaf spot from the seed. The fungicidal dust treatments with materials such as Agrosan, Ceresan, Cuprox, Oxicop and Tetroc reduce infection with these diseases to some extent, but they are not effective against bacteria or fungi carried beneath the seed coat. These dust treatments are essentially to protect the germinating seed from attack by certain seed rotting and damping-off fungi in the soil.

The only effective method of controlling the seed-borne pea diseases is to use seed harvested from crops free from these diseases.

Efforts have been made to produce disease-free pea seed in this State, but climatic and other conditions are such that yields are too small for the project to be economic. Thus, most of the seed used in New South Wales is of unknown status as regards freedom from seed-borne disease. It is expected that this unsatisfactory condition will not continue for long, as a pea seed "certification" scheme has been commenced in Tasmania and a similar scheme, but called an "approved pea seed scheme," has been introduced in Victoria. Already in Victoria there is a slight surplus of "approved" seed of the variety Greenfeast and some of this will be available to growers in New South Wales if required.

Labour for Rural Industries—Displaced Persons Immigration Scheme.

THE Acting Regional Director of Employment (N.S.W.) draws attention to the ample supply of labour which is available for rural industries, including individual farms and stations, etc., from the European Displaced Persons who are arriving in this country under the Commonwealth Immigration Scheme. These immigrants have been specially selected, and many of those who have already reached Australia are now engaged in rural occupations and are proving highly satisfactory workers.

Displaced Persons are required to remain in the employment to which they are sent by the Commonwealth Employment Service for a period of two years from the date of their arrival in Australia, though they may be transferred or withdrawn by the Employment Service if necessary. The employer is not, however, bound in any way to retain a Displaced Person if for any reason he desires to terminate the engagement.

Displaced Persons are available for any type of rural work or, in the case of women, for domestic work in the homestead. They must be paid award wages, or the ruling rate where there is no award, and the accommodation provided for them must be of an equal standard to that customary for Australian workers.

They do not, of course, all speak English with any fluency, and are not necessarily experienced in rural work or, in the case of women, Australian methods of cooking. They are, however, excellent types and very willing and adaptable, and experience has shown that language and other difficulties have easily been overcome. Every effort is made by the Commonwealth Employment Service to select the most suitable workers to meet an employer's requirements, and their fares from the Reception Centres to their place of employment are paid by the Commonwealth Government.

Rural employers who desire to secure the services of Displaced Persons or who would like further information are asked to apply to the most convenient District Office of the Commonwealth Employment Service. These are located in the larger towns throughout the State, and their addresses may be found in the telephone directories, or application made to the Regional Director of Employment, A.P.A. Chambers, 53 Martin Place, Sydney. Employers who can provide accommodation for a family group, or for married couples, will be given priority in their request.

New Prospects for Grasshopper Control.

IT is not known when the next grasshopper plague may be expected. There may be no serious developments in this connection for another year or two. However, no one was entirely satisfied with the measures available for 'hopper control in the past. There is no question at all as to the efficacy of the poison bran bait; the bait killed the 'hoppers once it was properly applied, but there were very real difficulties on the organisational side. It was sometimes impossible to get landholders interested in securing and applying the baits so that timely and effective action could be taken.

The advent of the new chemicals and the development of the fog or mist machines have materially changed the position. It is believed now, with proper organisation, that appropriate action can be more readily expected than was the case in the past. As you are probably aware, the Department in co-operation with other interested States of the Commonwealth is now engaged in developing plans for action against the 'hopper in one of the New South Wales "outbreak" areas. A great amount of preparatory work is necessary, but subsequently the test will show whether appropriate measures for a co-ordinated and successful attack on the 'hoppers can be developed—R. J. NOBLE, Under Secretary and Director, at the conference of Stock Inspectors.

Grain Sorghum for Stock.

GRAIN sorghum is a foodstuff with which many stockowners have had little experience. The following information on methods of feeding this grain should be helpful.

The grain is very similar in composition and food value to wheat and maize. It should be coarsely crushed or rolled for feeding to cattle and horses, and comparatively large quantities may be fed to cattle without producing digestive troubles. However, as it is a relatively heavy feed, it is best fed with some bulky feed such as chaff or silage or a bulky concentrate such as crushed oats or bran.

As with the other grains, sorghum has only a comparatively low protein content, and so must be supplemented with protein-rich feed such as lucerne or clover hay, or with protein concentrates such as linseed meal, or peanut meal. It may be substituted pound for pound for crushed wheat, crushed maize or crushed barley, and about four parts crushed grain sorghum may be regarded as equal to about five parts of crushed oats.

There is no necessity to crush the grain for pigs when it is given through self feeders, but if hand-fed to pigs it should be coarsely crushed, otherwise its digestibility will be considerably impaired. Sheep masticate all whole grain very thoroughly and there is no need to crush the grain for this stock.

Whole grain may be included in the grain ration for poultry, and crushed grain may be used as a considerable proportion of the mash.—DIVISION OF ANIMAL INDUSTRY.

Bacterial Spot of Tomatoes.

Can be Checked by Bordeaux Spray.

BACTERIAL spot, a disease which causes spots on the leaves and stems of tomato plants as well as unsightly blemishes on the fruit itself, has been prevalent in the central and north coastal districts of the State. Much fruit has been lost, particularly in the Coff's Harbour and surrounding districts.

This disease is introduced to a farm in the first place on the seeds, and then becomes established in the soil. It may be spread from plant to plant during pruning, but its chief method of dissemination is by wind-blown rain, or its equivalent—overhead irrigation.

There is no spray which will control the disease completely, but observations by departmental officers strongly suggest that the rate of spread is greatly reduced when home-made Bordeaux mixture is used. This check to the spread of the disease has not been noted when sprays made from powdered forms of copper oxychloride have been applied to the plants.

For this reason farmers are advised to use a home-made spray (containing bluestone, 1 lb.; new season hydrated lime, 1 to 1½ lb.; and water, 40 gallons) in preference to ready-prepared commercial spray powders.

Wherever possible, in addition, overhead watering should be replaced by some form of trench irrigation.

Persons seeking further information on the preparation of Bordeaux mixture may obtain directions by applying to the Chief Biologist, Department of Agriculture, Box 36A, G.P.O., Sydney.

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PESPRUF 4G DUST 2% D.D.T. and 2% Benzene Hexachloride for use in severe infestations of caterpillars and aphis.

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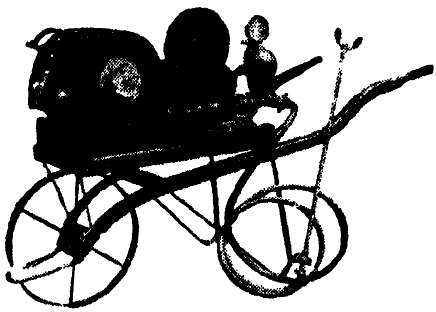

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INSECT PESTS.

Notes contributed by the Entomological branch.

THE GLADIOLUS THRIPS

(*Taeniothrips simplex*)

THIS thrips was first described in 1930, from specimens collected from carnation flowers in South Australia, in 1928. It is a widespread and serious pest of the gladiolus in New South Wales, and if adequate control measures are not undertaken, it is not uncommon for the entire crop to be ruined. It also causes losses in a number of other countries, including the United States of America, Canada, South Africa, Jamaica, Bermuda and the Argentine.

Nature of Injury.

Unlike many other species of thrips, it is somewhat restricted in its range of food-plants. Although preferring the gladiolus, it may also infest iris, calla or arum lily, torch lily or "red-hot poker" (*Kniphofia* sp.), montbretia (*Tritonia* sp.) tiger flower (*Tigridia pavonia*) and carnations.

In both its adult and larval stages, this thrips feeds by rasping the surface of the plant tissues and sucking up the sap which exudes. This injury causes a characteristic silvering on the foliage, and if the leaf damage is extensive, the new corm may be considerably stunted. As soon as the flower spikes develop the thrips make their way into them and cause the blooms to become deformed, or even prevent them from opening. This injury is often attributed by growers to other causes, such as drought or disease.

It is well known that there is considerable varietal resistance to attack, but in general, light-coloured varieties are least liable to damage, and deep reds and purples are most severely affected, although there are exceptions to this. Slight injury on dark blooms appears as irregular white or flecked areas, and this considerably reduces their market value.

In addition to destroying the foliage and blooms, this thrips will also continue to feed and breed on the corms in storage. The surface of the corms becomes sticky, and later, hard and scabby, thus greatly lowering their market value. The young root buds may also be injured and their subsequent development affected.

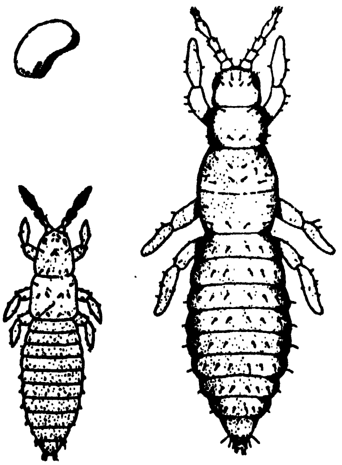
Description and Life-history.

The adult females, which measure about one-fifteenth of an inch in length, are dark-brown in colour and possess two pairs of delicate, fringed wings. The males are slightly smaller than the females.

The minute, kidney-shaped eggs are inserted in various parts of the plants, and there are two larval stages, a prepupal and a pupal stage, in both of which the insects are lemon-yellow in colour. The larvae and

The Gladiolus Thrips.

prepupae are to be found within the leaf-sheaths and flower buds, but the adults feed mainly in the open. The pupal stage may be passed either on the plants or in the soil.



Egg, First-stage Larva and Second-stage Larva of the Gladiolus Thrips.
[*After Mackenzie.*

The life-cycle, from egg to adult, may be as short as ten days, but under cool conditions may occupy a month or more. The adults may live for a month or more, and a number of generations develop during the year. In the Sydney district, all stages have been observed on volunteer plants, in private gardens, during the winter months.

This insect thrives best under hot, dry conditions. Cool and wet weather affect them adversely and heavy rain, at times, destroys large numbers.

Control.

As volunteer plants provide a ready source of infestation, these should be pulled up and destroyed some time before the main crop is planted.

Commercial growers whose properties are somewhat isolated from areas in which gladioli or other listed host-plants are growing, would be well advised to make a break in planting, so that for a period of several months there is no foliage on which the thrips can feed and develop. Endeavours should be made to select, for new plantings, ground which is as far removed as possible from old plantings, or from private dwellings in the grounds of which volunteer plants and uncontrolled thrips infestations commonly occur.

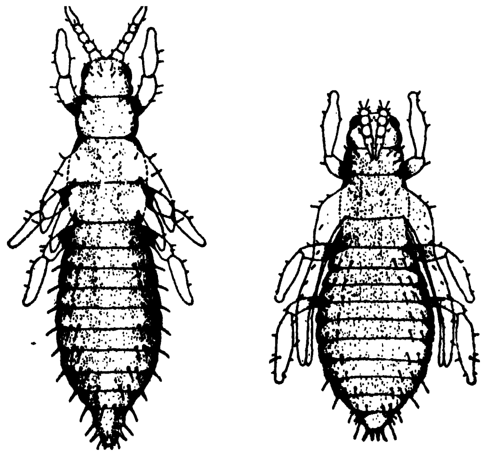
The adult thrips do not fly readily, and migration through an area of gladioli, while slow, is greatly assisted by wind. Based on this fact, an overseas recommendation for areas where there is a dominant prevailing wind, is the planting of the early-blooming varieties in the beds most distant from the direction from which the wind blows.

When water is available, the frequent use of overhead sprinklers, or frequent and thorough hosing of the plants, will retard the development of the thrips. The drainage of the ground should be satisfactory if either of these methods is adopted.

Storage of Corms.

The storage of corms in flaked naphthalene in paper bags or other suitable containers for a period of three weeks is effective; but the treatment should be completed before the corms shoot, as otherwise some injury may result. About 1 oz. of naphthalene should be used with each 100 corms.

Other methods of corm treatment include the use of hot water, storage at a temperature of 50 deg. Fahr., fumigation with calcium cyanide, dipping in corrosive sublimate (mercuric chloride) solution and other mercuric compounds.



Prepupa and Pupa.
[*After Mackenzie.*

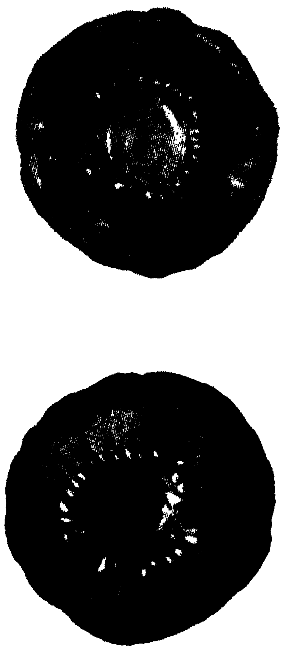
Field Control.

Owing to the fact that the larvae feed within the leaf-sheaths, control of field infestations is very difficult, and the application of foliage poison sprays has given the best results. The newer insecticides, DDT,

BHC and E605, now offer easier methods of control than the older type foliage poison sprays and DDT is now in general use.

Cover Sprays.—

DDT spray is used at a concentration of 0.1 per cent. (3 fluid oz. of 20 per cent. DDT emulsion to 3¾ gallons of water). A suitable spreader may be added with



Thrips Injury on Corm.

Above: **Corm showing injured area and killed rootlets around basal plate.**

Below: **Uninjured Corm.**

[*After Weigel.*

Thrips Injury to Foliage and Flower Spikes.

[*After Weigel.*

advantage to some types of DDT sprays. The plants should be examined for the first signs of infestation and treatment then commenced. Later when the thrips become more numerous it may be necessary to apply the spray at weekly intervals.

Recent work with E605 has given promising results, but it is yet too early to make any definite recommendations for its use.

Foliage Poison Sprays.—

Paris green, ½ oz.; brown sugar, 2 lb.; water, 3 gallons.

In the United States of America the following spray is frequently used:—

Paris green, ½ oz.; molasses, 1¼ pint; water, 5 gallons.

This spray has been found more toxic, but the disadvantage of sprays containing Paris green is their liability to cause foliage burn, particularly when the humidity is high or the plants are not in a thrifty condition. Paris green settles rapidly, and it is particularly important that sprays containing it are thoroughly agitated.

Another spray that is highly toxic to this thrips and has the added advantage that it does not injure the foliage, consists of:—A high grade tartar emetic (antimony and potassium tartrate), 1 oz.; brown sugar, 4 oz.; water, 10 pints. This spray has given as good results as DDT, where it has been properly applied.

These foliage poison sprays should be applied in the form of a fine mist, and spraying should be commenced as soon as the first injury is noticed and repeated at weekly intervals until the first flowers open. The plants should be closely examined at regular intervals from their early stages of growth onwards.

Dusts.—

Dusting at weekly intervals with a dust consisting of:—

Derris powder, 1 lb.; kaolin or talc, 8 lb., has also given good results.

A 2 per cent. BHC dust, or a 2 per cent. DDT dust, and a dust consisting of a mixture of equal parts of 1 per cent. DDT and 1 per cent. BHC, can also be used satisfactorily.

Fuller's Rose Weevil (*Pantomorus godmani*)

REPORTS have been received on a number of occasions of moderate to severe damage to early bean crops by the larvae of this weevil, in the Matcham and Kincumber districts, and an account is given here of the causes leading up to the infestations. In addition to beans, small areas of early tomatoes, marrows and cucumbers have been similarly attacked.

The injury consists of the destruction of the fibrous roots and the gouging out of tissues from the main root. This results in severe stunting, and sometimes the death of the plants. Where the injury is not so severe, the plant's reaction may result in a lowered yield of pods, which harden very quickly, and are of poor quality.

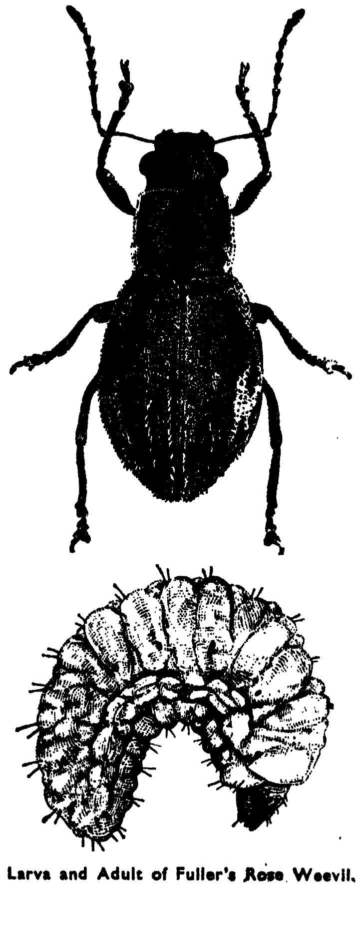
This type of injury is becoming increasingly common and may be expected to be a permanent problem in those districts—where spring beans are sown on land which has supported a heavy growth of weeds such as paddy's lucerne, fat hen or purple top, during the previous winter.

The weevil injury to beans is due to the practice of ploughing such weed-infested ground during the autumn or early winter and then sowing beans after a short period of soil preparation. The larvae are almost invariably present on the roots of the weeds, and they transfer their attention from these to the developing bean plants. Even where the larvae are not present, there may be overwintering eggs which hatch in early spring, and these larvae attack the beans.

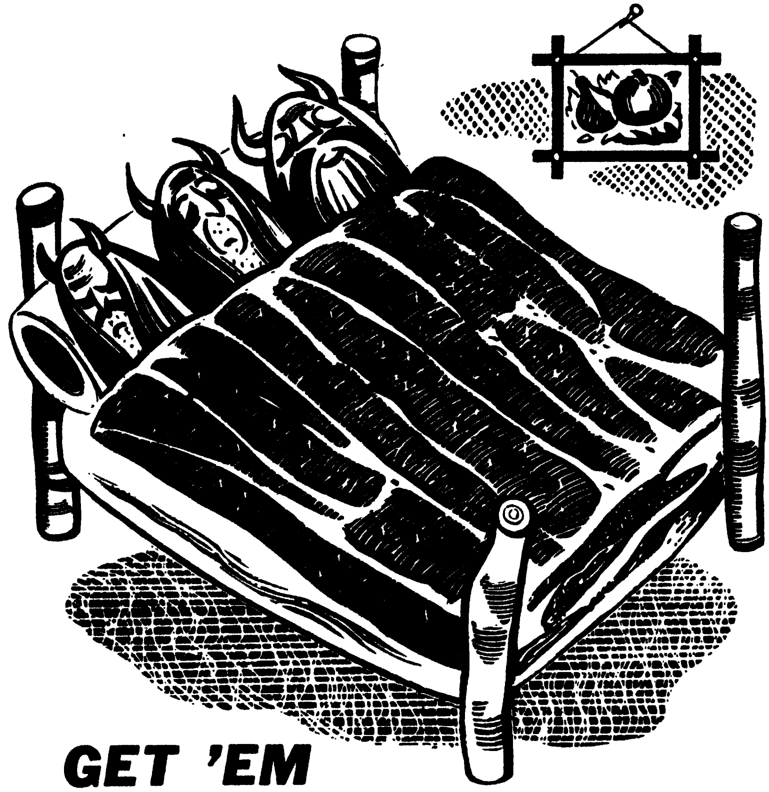
In order to avoid such injury, it is essential that weed control on land to be planted to beans, from about mid-June onwards, must be commenced early in the year, preferably during January.

As the weevils feed and deposit their egg masses mostly from February to May, it is important that the land be free of susceptible food-plants during that time. Land under grasses such as summer grass or paspalum, is not likely to be infested with weevils, and cereal crops are not likely to harbour them. Consequently, the provision of a bare-fallowed area, or preferably the establishment of an early cereal crop on land which is later to be used for early beans, would be a satisfactory means of preventing injury.

The system of land use in practice, in the districts mentioned, is to allow the land to remain undisturbed after the spring bean



Larva and Adult of Fuller's Rose Weevil.



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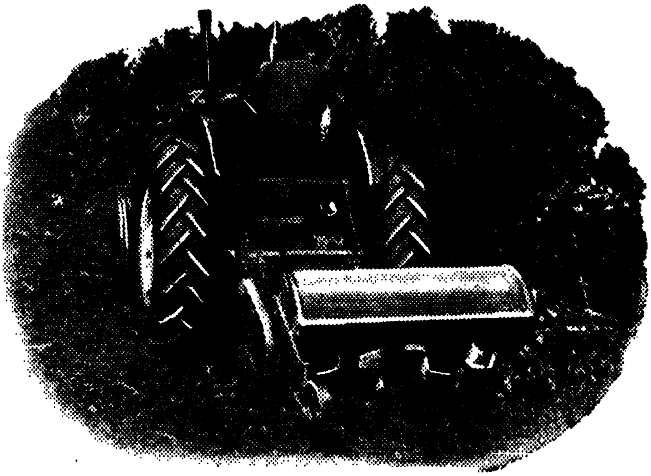

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crop has been harvested, and gradually this becomes covered with a growth of herbaceous weeds, especially paddy's lucerne, on the high and dry early areas. Sometimes this land is sown to early beans, year after year, this being the only crop. In other instances the ground may go out of use for a year or more, during which time it grows only weeds. This type of rotation is undesirable.

A general reluctance to work this land more often than is absolutely necessary, especially from the point of view of soil erosion, has established the existing farming system, which has, in the past, proved satisfactory. Any change, which may be necessary to avoid weevil damage, will have to take into account such cultural factors.

It is suggested that a rough working of the land in January or early February, followed by the sowing of a cereal crop in March, preferably an early maturing variety of oats, such as Buddah or Mulga, which could be turned under in May, would offer a satisfactory solution to the problem.

An alternative rotation, suggested by the Division of Plant Industry, might be—land ploughed in January, sown in February with an early variety of peas for market, and followed by beans in June or July. The Division points out, however, that a green manure crop ploughed under immediately prior to sowing of a cash crop may be a disadvantage in a dry season, because undecomposed vegetable matter causes the soil to dry out rapidly.

—P. C. HELY, Entomologist.

Effect of Marshmallow on Production and Quality of Eggs.

DURING the past year experiments were carried out at the Poultry Experiment Farm, Seven Hills, to test the effect of various weeds and weed seeds on production and quality of eggs. Among the seeds used was Marshmallow.

Hereunder is an extract from a report submitted by the Council for Scientific and Industrial Research, which co-operated with the Department by cold-storing the eggs and examining them for quality defects:—

"ABNORMALITIES IN HENS' EGGS RESULTING FROM THE INGESTION OF PRODUCTS FROM MALVACEOUS PLANTS.

"It had previously been indicated that 'pink' or 'amber' whites and 'custard-like' yolks probably arose from the inclusion in the hens' diets of the products of Malvaceous plants, such as the seeds of marshmallow.

"A series of experiments on the effects of these products on hens and on their stored eggs was carried out and the results are presented in the following section.

"Attention is drawn to the following important points:—

(*a*) Ingestion of 5 per cent. marshmallow seed in the mash resulted in a marked decline in productivity of the hens.

(*b*) Serious abnormality in the yolks of eggs occurred during storage when the hens had been fed mash containing mallow seeds.

(*c*) Oiling of the eggs increased the incidence of this abnormality (a similar effect was found for cotton-seed oil in the diet).

(*d*) Ingestion of leaves of the mallow plant will probably cause abnormalities in the yolks and/or whites."

The details of the experiments were made available by the Council for Scientific and Industrial Research at the annual meeting of the Egg Producers' Council held in Perth recently.

The following comment is made by the Principal Livestock Officer (Poultry), Mr. E. Hadlington, who attended the meeting:—

"From the above results it is apparent that marshmallows have a detrimental effect on egg quality and rate of production, and while it might be difficult to prevent the birds having access to such a widespread weed, every effort should be made to avoid its consumption by the laying flocks."

THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

THE COST OF PRODUCTION

WHAT does it cost to produce a bushel of wheat, a gallon of milk, a pound of butter, a dozen eggs or a bushel of apples? These questions and questions like them, have been asked very frequently of late in Australia, and a number of attempts have been made to answer them. The subject of production costs has, in fact, raised so much interest in rural circles and so many rural organisations have asked that cost inquiries be held that it is worthwhile examining the methods which may be used to ascertain costs and the peculiar difficulties involved in such surveys.

However, in order to retain perspective, it is necessary to emphasize (before considering these issues) the strongly competitive position in which Australian agriculture is placed in all its phases. The facts are, of course, that our exports have to compete on world markets, both in quality and price, with the exports of other countries, whilst in the ups and downs of internal markets every farmer must in effect compete with his neighbours. It is clear, therefore, that the only sound policy for the individual, as it is for a national industry as a whole, is to keep production costs at all times as low as possible, for there can be no brief under any circumstances for relatively high production costs. That is the surest signpost to failure in any branch of agriculture.

How are Production Costs Determined?

Before setting out to discuss the ways in which unit production costs—the cost of producing a bushel of wheat or a gallon of milk—may be determined, it is worth drawing attention to the fact that the farmer's, or for that matter the manufacturer's, costs of production at any particular time are determined by two distinct factors.

First there is the cost of his means of production—the price of land, and the price of feed or seed, of machinery and other equipment, of fuel and fertiliser, of labour and livestock and of all the other materials and resources which he uses to produce his wheat or milk. Obviously when the prices or costs of these resources are high his production costs will be relatively high; when they are low his production costs will be relatively low. Therefore his production costs will vary as the prices of the various resources he uses vary.

Secondly his production costs will depend upon the way in which he combines his various resources to produce his final product. In other words his production costs will vary according to his efficiency. And thus several farmers operating under precisely similar conditions on similar farms

equally well equipped and equally capitalised, will have several different costs per unit of production. Possibly each farmer's production costs will be different from the others. In other words some farmers, operating under precisely similar conditions, will "do better" than others; some will have much higher incomes than others, solely because some are much more efficient—better farmers and better businessmen—than are others.

It is therefore obvious that production costs will fluctuate very greatly from farm to farm in any one year due to differences in land values and other costs and above all due to differences in farmers' managerial efficiency.

But costs differ equally as much from year to year on the same or similar farms —due solely to variations in seasonal conditions. Obviously seasonal conditions will have a significant effect on production costs —it may cost one farmer 4s. per bushel to produce wheat in a good season when he harvests 24 bushels per acre and 10s. per bushel in a year in which he harvests only 9 bushels per acre.

And so, for the several reasons outlined above it is apparent that for any one product there will be a vast number of individual production costs. In 1934 the Royal Commission on the Wheat, Flour and Bread Industries estimated that the cost per bushel of producing wheat was as low as 1s. 1d. on some farms and as high as 19s. 11d. on others. In 1948 the Commonwealth Wheat Costs of Production Committee found an even greater variation.

As might be expected such variations are not confined to the wheat industry. The Joint Dairy Industry Advisory Committee which recently investigated the costs of producing butter has stated that costs varied between 3d. and 7s. per lb.

"Average" Figures.

Published cost figures are, therefore, almost always "average" figures—a particular figure being accepted somewhat arbitrarily as the cost of production. Such a figure is, of course, *an* average cost figure. It is one of several average figures which might be used, for averages may be, and are, determined in a variety of ways depending upon the use to which they are to be put. Other average figures determined in different ways may vary from the figure which is used, and which becomes the generally accepted "*cost of production.*"

Other Difficulties.

Not only do costs of production vary greatly from farm to farm, but, unlike most manufacturing and distributing businesses, it is impossible to divide the farm business into two or three distinct compartments, so that, for instance, the wheat enterprise can be costed independently of the sheep enterprise or the pig enterprise separated from both. The fact is that, in this example, the sheep enterprise is supplementary to the wheat enterprise—the two are part of one another and cannot be separated any more than the production of wheat grain can be separated from the production of wheaten hay. In costing the sheep enterprise, for instance, how should the nutriment obtained from grazing the sheep on wheat stubble or the feeding off of green crops be dealt with? And in costing wheat what proportion of the expense of operating machinery, which is used not only for wheat but perhaps also for oats, barley, linseed and grain sorghum, be allocated to the wheat enterprise? This is to mention just two of the many problems which will arise, involving arbitrary allocations.

So many arbitrary decisions are required that it would be possible for two persons working from the same figures to arrive at two different cost figures by virtue of the fact that joint and overhead costs were allocated in a different manner.

Stated simply the position is that it is impossible to cost accurately individual enterprises on a mixed farm, and any attempt to do so may give grossly misleading results. Consequently because it is impossible to cost individual enterprises it is not possible to ascertain individual production costs. Certainly arbitrary allocations of overhead costs can be made and joint costs—that is costs which are shared between two or more enterprises—can be divided on some preconceived basis and a figure purporting to show production costs can thereby be obtained. In fact such figures have often been published, but they are of very doubtful validity and of doubtful value, and, as already stated, may be quite misleading.

Records Not Available.

Despite the serious objections already raised to the "enterprise" method of costing, it is more satisfactory, or perhaps it should be said, relatively less unsatisfactory, than any other available method of costing agricultural products. However, it can only be used if detailed labour, feeding and cropping records are available. As such records are very rarely available, another method of costing has been adopted by most persons or committees who have inquired into the cost of producing primary products in Australia.

This method is simpler and requires only a statement of total expenses and of income, divided into income from the enterprise to be costed and all other income. With this information available it is alleged that production costs can be obtained, and certainly under some very rare circumstances they can. But such an assumption is only true when income from the product being costed forms an overwhelming proportion of gross income. Where it accounts for less than 75 per cent. of gross income the method is likely to be quite unreliable. Most Australian farms are of a diversified type and therefore derive their income from several sources. For example the average wheat farmer obtains a substantial portion of his income from the sale of wool, sheep and perhaps oats, barley and hay. Consequently it is only rarely that this method of costing can be regarded as even reasonably reliable. In most recent investigations the inadequacies of this method have been realised and some attempts at refinement have been made, so that admittedly the method is not always used in quite such a simple form as is suggested above. Nevertheless the figures obtained are still largely arbitrary, and there still remains the problem of averaging and the particular average to be chosen.

Why Obtain Costs?

If then it is virtually impossible to ascertain unit production costs with any degree of accuracy, and if costs vary so widely in the same season and even more widely from season to season, it is worthwhile going to the trouble involved in ascertaining such costs?

In so far as the individual farmer is concerned, the answer is a simple "no." Knowledge of his production costs in a *past* season, if such could be obtained, would not help him to improve the management of his farm. But not only this, alleged production costs may often be misleading. Paper costs may indicate that, for example, it cost a particular farmer 4s. 6d. per bushel to produce oats when his return per bushel is only 4s., and yet his overall profit from the farm might be reduced if he were to eliminate his oats enterprise. The farm business must always be viewed as a whole —individual enterprises are inseparable, and therefore individual unit production costs are useless.

This does not, of course, mean that the farmer should not keep detailed records of his farm business—such are essential to the proper management of his farm and the varied uses to which they may be put have been outlined on several occasions in the *Gazette*.

The general demand for production cost inquiries has come, not from farmers desirous of improving their efficiency, but largely from farmers' organisations anxious to obtain an increased price for their products. They have asked that production costs be used as a basis for determining the price to be paid by the Australian consumer, and perhaps by the overseas buyer, for many Australian rural products. This prompts the question: is a knowledge of production costs of value, having in mind their many weaknesses and limitations? The answer to this question is perhaps not quite such a simple one.

In the long term, at least, prices can never be fixed with regard solely to production costs, even if those costs are known. The supply likely to be induced by setting a particular price, and the demand at that price, must be taken into consideration—in fact these are the major factors to be considered. In addition the effect on competing products cannot be overlooked. Thus, irrespective of the validity of the cost figures in question, production costs can never serve as anything other than a guide in price fixing—there are factors, at least as important, if not more important—to be taken into consideration.—P. C. DRUCE—Economics Research Officer.

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NEW SOUTH WALES FARMS ARE BECOMING LARGER

CHANGES in the size of farms are long-term happenings which proceed rather slowly for many years before they arouse comment. The publication some months ago, of the population figures (1947 Census) for country and city areas in New South Wales drew attention to the drift from the land. This drift is paralleled by a reduction in the number of farms in this State and an increase in average acreage per farm.

Average farm size in New South Wales (excluding the Western Division) reached a record low of 975 acres in 1914-15, but has been increasing steadily in the last thirty-five years. In 1946-47, the average acreage per farm was 1,285 acres—an increase of 32 per cent. There was a substantial difference in the changes in the various Divisions. Coastal Divisions showed little or no increase in average farm size in this period, the increase being greatest in the Tablelands and substantial in the Western Slopes, Central Plains and Riverina.

Averages do not, however, provide a complete picture. In the last fifty years most of the very large holdings which formed the backbone of our rural economy in the nineteenth century have been broken up by means of compulsory resumption and subdivision or voluntary sale on the part of the large landholders. Thus in 1891, there were 750 graziers with flocks of 20,000 head or more who ran over 60 per cent. of all the sheep in this State. In 1941 there were only 156 graziers with flocks of more than 20,000 head, accounting for about 9 per cent. of all sheep in New South Wales. In 1911 over one-third of the rural land in New South Wales (excluding the Western Division) was farmed in areas of more than 20,000 acres; in 1947-48 areas with 20,000 acres or more accounted for only 15 per cent. of the total area.

On the other hand there has been a considerable decline in the number of small farms, which has more than counterbalanced the subdivision of large estates and has thus increased the average size of farms.

In the last twenty years the number of farms with less than 1,000 acres declined by approximately 5,600; whilst the number of farms with 1,000 to 10,000 acres increased by approximately 1,650. This decline of small farms has occurred in spite of considerable increases in irrigation, dairying and other forms of rural activity associated with small farms.

The main reason for this decline of the small farm is that, generally speaking, larger farms are more efficient units of production. It is, of course, true that many small farms are run efficiently and provide a reasonable and sometimes a very good living for the operator, but, on the average, large farms are able to provide larger earnings per head than small farms. Whilst it is true, in many cases, that small farms are able to use their land more intensively and to produce more per acre than their larger counterparts, the amount of labour and capital used on the smaller farms, in relation to their total production, puts them at a disadvantage.

In the case of the pastoral industry the increased capital necessary on smaller properties reduces the profitability of small farms. The Rural Reconstruction Commission has pointed out that "if a sheep station carrying 15,000 sheep and earning interest on £5 per acre is cut up into ten smaller properties, the net capitalisation per acre may well rise to between £6 and £7 per acre before the settlers have established their holdings in proper working order." Hence it is not surprising to find that the average size of sheep flocks in New South Wales is increasing again.

Between 1891 and 1921, when there was a great increase in the number of small flocks carried on wheat farms or used for fat lamb breeding and a considerable number of the largest pastoral properties were subdivided, average number of sheep per flock fell from 4,689 to 1,257. Since 1921 there has been an increase, though of much smaller proportions in the average flock size, the average size of sheep flocks in New South Wales in 1941 being 1,599. Large sheep

flocks (*i.e.*, flocks with 20,000 sheep or more) are still declining in numbers and importance, but sheep flocks with 2,000-5,000 sheep are becoming very much more important.

In the case of wheatgrowing a similar trend towards larger acreages is noticeable. In 1920-21, of all holdings growing wheat (for grain), 62.8 per cent. grew less than 200 acres. In 1947-48 only 38.8 per cent. of all holdings growing wheat (for grain) grew less than 200 acres. Similarly the proportion of holdings growing 300-800 acres of wheat for grain increased from 18.7 per cent. in 1920-21 to 37 per cent. in 1947-48. Very large holdings growing over 2,000 acres of wheat have shown a tendency to decline.

The dairying industry is one of the few rural industries which has not shown any marked tendency towards increased units of production. Mechanisation in the dairy industry has had the effect of reducing the amount of hired and family labour (especially female labour) used per farm, rather than of increasing the number of stock carried per farm. There has been a certain increase in the quantity of production per dairy farm in New South Wales (measured in terms of whole milk), but this increase is the result, not of an increase in the number of stock carried but of an increase in production per cow.

This does not mean that small farms in the dairying industry are as efficient as large farms. On the contrary, according to the recent inquiry into the cost of production of butter, costs per unit seem to rise fairly rapidly as production per farm declines. However the advantages of larger farms are probably not as pronounced in the case of dairying as they are in the case of, for instance, wheat growing.

As mechanisation proceeds and as farmers become more efficient, we can expect this trend towards larger farms to continue. It is a trend which is not confined to New South Wales or Australia; figures for farm size in the United States, Canada and Great Britain show a similar increase in the size of the farm unit. Although many of us may deplore the fact that fewer and fewer people are living on our farms, the increase in farm size is a good sign in as far as it shows that our productive efficiency is improving and such improvement of productivity provides the only real basis for improvement in our overall standards of living.—F. H. GRUEN, Economics Research Officer.

Danger of Introduction of Oriental Fruit Fly.

THE occurrence of the Oriental fruit fly in the Hawaiian Islands is causing fruit and vegetable growing interests in western North America considerable concern.

It is rather remarkable that this fly was not introduced into Australia during the war. As so many regular air services are now established, however, there is a very real danger that the fly may still be introduced into Queensland or New South Wales.

In the United States, precautionary measures have already been adopted with the object of preventing introduction of the fly. These measures include:—

(1) Inspection of all planes, baggage and plant material before leaving Honolulu for the mainland, to ensure that all material likely to carry Oriental fruit fly is removed.

(2) Spraying planes with DDT-pyrethrin mixture before departing for the mainland.

(3) Spraying buildings around Honolulu airport with a DDT solution to reduce the number of flies that might accumulate in the vicinity.

(4) Maintenance of bait traps at all overseas airports in the Hawaiian Islands to reduce fly populations in their vicinity.—T. MCCARTHY, Chief Entomologist.

THE improvement in production and returns obtainable by better feeding should not obscure the improvement obtainable by breeding. A large number of cattle are incapable, no matter how well fed, of producing 250 lb. of butter-fat per year. These low-producing cattle are a drain on dairymen's pockets. Not only are they inefficient converters of food to milk when hand-feeding, but in good seasons they cannot respond with a large increase in milk production.

Herd recording, culling of low producers, and breeding from high-producing cows and progeny tested bulls are as essential as better feeding for more profitable production.

Further Experiments on

THE CONTROL OF THE QUEENSLAND FRUIT FLY

(*Strumeta tryoni*)

●

A. H. FRIEND, B.Sc.Agr., Entomologist.

TWO series of tests, with Narrabeen plums and China pears, were carried out during the past season. Results, generally speaking, continue to favour the sugar-bait technique, and a high-grade tartar emetic-sugar bait gave the greatest amount of fruit free from stings.

Trees treated with one of the newer insecticides, E605, yielded fruit which, although heavily stung, did not develop maggots. This is the first occasion on which 100 per cent. control, at least in respect of maggot development, can be claimed.

NARRABEEN PLUM EXPERIMENT.

At Turramurra, under conditions where fruit fly has always proved as bad as can be, baits were made up and applied fresh to trees of ripening fruit on the following dates:—21st December, 24th December, 1st January and 5th January.

Owing to the small number and irregular planting of the trees, replication of treatments was inadvisable; however, the untreated (check) block stood apart from the treated blocks, separated by a few rows of early peach trees. As the treated blocks were rarely more than three trees deep, overlapping effects of the treatments are considered quite likely.

Two gallons of bait per application were splashed on to the trees in each treated block. As the number of trees per block varied, so did the dosage per tree. No burn from either bait occurred with foliage or fruit.

On 6-7th January, ripe and firm fruit, capable of colouring on keeping, was picked and recorded as stung or not stung.

The following table sets out the results:—

TABLE 1.—FRUIT FLY CONTROL WITH NARRABEEN PLUMS.

	Treatment				Results.
	Quantity of active ingredient.	Sugar.	Water.	Bait used per tree per application.	Percentage of fruits not stung.
	Oz. or Fl. oz.	lb.	Gals.	Fl. oz.	Per cent.
Check ...	...	...	...	nil	50·33
Tartar-emetic	2	2	4	13·3	91·30
Black leaf 40-DDT (20 per cent. emulsion) ...	1–2	2	4	9·4	82·37
E605	1/5	2	4	9·4	68·17
HETP ...	1	2	4	8·0	67·86

Although differences in amounts of bait applied per tree may account for some of the resultant differences, it is apparent that considerable advantage (compared with check) was obtained with all baits.

Possibly of more importance than other factors, is the fact that this experiment covered a period during which there was a depression of fruit fly activity as compared with a period of extremely high stinging intensity which immediately preceded it in December. At that time all the earliest colouring fruits were being stung irrespective of treatment. It is considered that it was only a decline in fly activity which allowed the large differences to appear between treatments and the grower to obtain a higher percentage than usual of marketable fruit. This was further emphasised by the fact that a subsequent picking of fruit from the check trees, a week later than the experimental sample, was found to be 90 per cent. free of stings.

CHINA PEAR EXPERIMENT.

At St. Ives in February, under conditions of the most intense fly activity encountered during 1948-49, a row of seventy-five large China pear trees carrying a heavy crop was used for five different treatments, each replicated thrice, using five-tree plots as units.

Treatments.

In addition to the untreated check, two different materials were used as cover sprays and two sugar bait formulae were tested.

Cover Sprays.—A small power outfit delivering spray at 175-200 lb. pressure was used and the whole tree and fruit covered,

taking approximately 1½ gallons per tree. Three applications at weekly intervals were made—on 2nd, 9th and 16th February.

The cover spray mixtures were:—

(*a*) 0.2 per cent. DDT (50 per cent. water dispersible powder plus wetting agent);

(*b*) 0.2 per cent. E605 (74 per cent. emulsion concentrate diluted).

Sugar Baits.—The sugar baits consisted of insecticide mixed in a solution of 2 lb. sugar in 4 gallons of water. These baits were freshly mixed for each application, which was made by splashing the mixture from beneath the tree, up into the branches, by means of a kalsomine brush dipped into the bucket of bait. The quantity of bait per tree per application was 21 fl. oz. and the dates of application were 2nd, 5th, 10th, 13th, 17th and 19th February.

The poison constituents of the baits were —(*a*) 2 oz. of a high grade tartar emetic in 4 gallons water, or (*b*) 0.2 per cent. actual E605.

Spray Injury.—Spray injury in the form of leaf scorch occurred only on all the 0.2 per cent. E605-treated plants, and was not of a serious character.

Results.

Fruit was picked from the centre tree or trees of each five-tree plot on 21st February. Each sample was placed in a box and common stored until examination on 9th, 10th and 11th March, when the number of stings on each fruit was recorded and likely fruits cut open for determination of presence or absence of fruit-fly maggots. A further examination for maggots in the remainder was made on 16th March.

Resulting figures have been statistically analysed for significant differences and the averages for each treatment are presented in Table 2.

TABLE 2.—FRUIT FLY CONTROL WITH PEARS.

Treatment.	Percentage of fruit not stung.	Number of stings per fruit.	Percentage of maggoty fruit.
	Per cent.		Per cent.
Check	0·4	5·42	74·3
E605 cover spray	2·1	3·17	0·0
DDT cover spray	19·9	2·37	34·9
E605 sugar bait	34·0	1·41	2·4
Tartar emetic-sugar bait ...	59·9	0·65	14·8

From the results it has become apparent that—

1. All treatments, except E605 cover spray, were significantly better in all respects than the check no-application. E605 cover spray was significantly better than check in respect of stings per fruit and maggoty fruit.

2. The baits, collectively, were more efficient than the cover sprays in preventing flies stinging fruit in the field. In the case of E605, for which both bait and cover spray were employed, there was statistical significance in favour of the bait. This becomes even more important when it is realised that about one-twelfth the dose of E605 was delivered as a sugar bait than was applied as a cover spray.

3. Of the baits, tartar emetic-sugar gave considerably greater freedom from stings than E605-sugar. The difference, however, did not reach the level of statistical significance.

4. Of the cover sprays, DDT likewise was better in preventing fly-stinging than E605 but not significantly so. In respect of maggoty fruit, however, there was a significant difference in favour of the E605 cover spray, in which case an estimated 90 per cent. of eggs laid by the fly did not hatch and the remainder were found to have died at or shortly after hatching in the fruit.

5. In respect of maggoty fruit, there was no significant difference between the results obtained with E605 bait and cover spray.

Further Observations.

Allman* and other investigators have reported on an indirect sterilising effect of tartar-emetic and sodium fluosilicate baits upon fruit-fly eggs. However, in the results here presented the disparity between both the two E605 treatments in respect of sting reduction and maggot development, indicated that a different type of maggot prevention was operating.

A thrice replicated laboratory trial with adult fruit-flies was accordingly set up on 16th March. Flies in small cages were offered, as sole food, either (*a*) a skin surface from an E605 cover-sprayed pear, (*b*) a flesh surface of the same pear (with flesh

* Allman, S. L., 1940. After-Effects of Feeding Queensland Fruit Flies on Poison Baits, *Jour. Aust. Inst. Agr. Sc.*, 6: 211-3

(*Continued on page* 334.)

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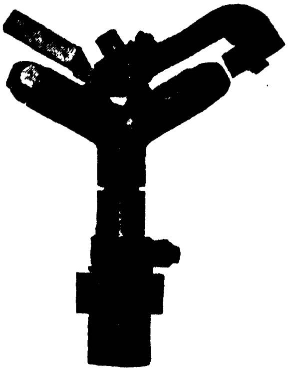

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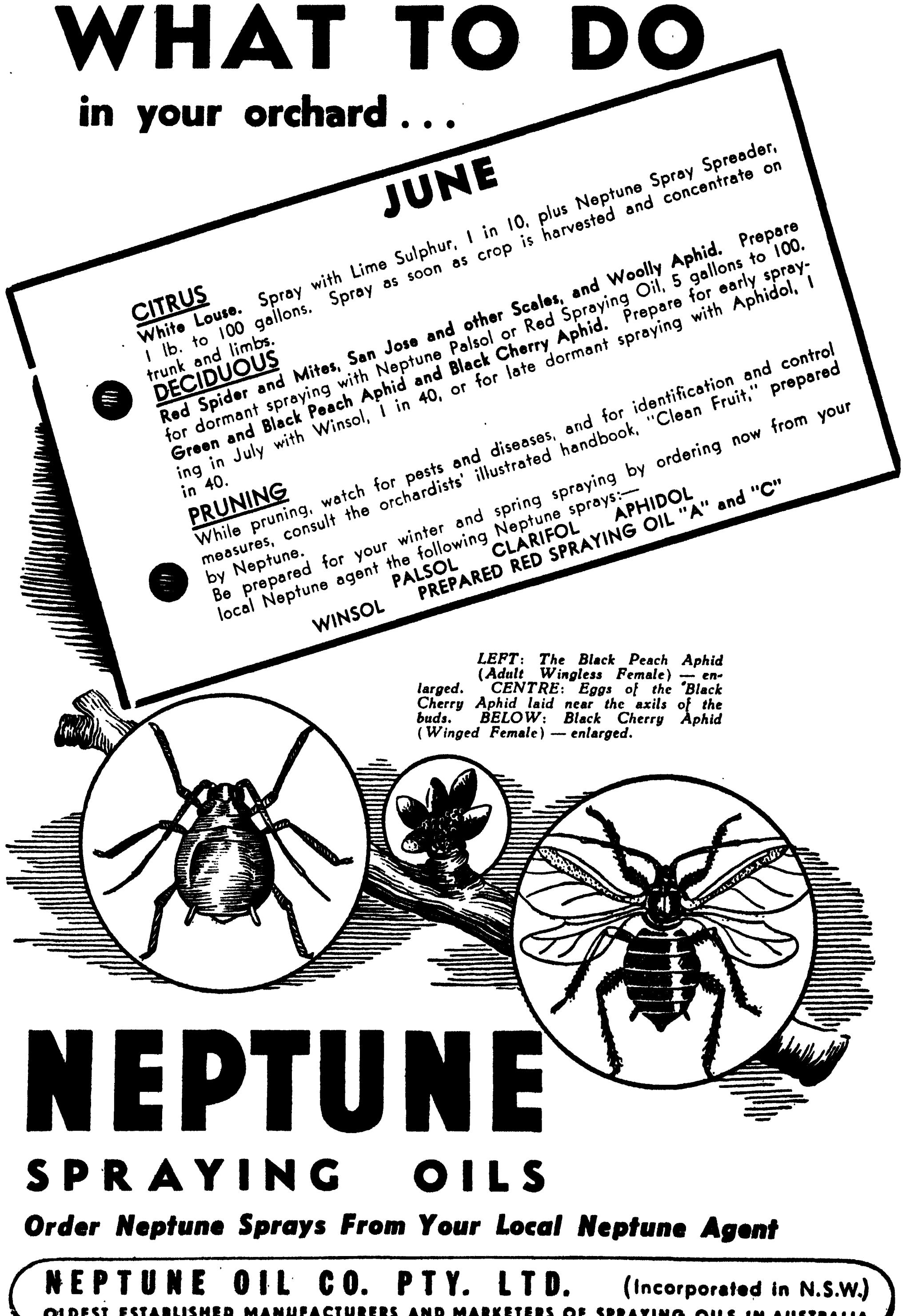

LEFT: The Black Peach Aphid (Adult Wingless Female) — enlarged. CENTRE: Eggs of the Black Cherry Aphid laid near the axils of the buds. BELOW: Black Cherry Aphid (Winged Female) — enlarged.

FRUITGROWING

WINTER PRUNING OF CANNING PEACHES
On the Murrumbidgee Irrigation Area

A. E. VINCENT, Fruit Inspector.

IN the May, 1942, issue of the Agricultural Gazette, Messrs. Ballantyne and Horth recommended a system for pruning canning peaches which had evolved during over twenty years' experience with this kind of fruit. Experience since 1942 has confirmed the suitability of this system, and it is the purpose of this article to discuss generally the method of pruning recommended, with particular reference to young trees.

The objective of the orchardist when planting canning peaches is to have trees which will give him maximum crops of canning-size fruit as quickly as possible and at the lowest cost of working and harvesting. It has been found that the low-headed, open-centred type of tree with its limbs inclined at an angle of approximately 30 degrees from the vertical allows for convenience of the cultural operations of tillage, spraying and harvesting; for strength to carry good crops; for admission of the correct amount of light and heat that is essential for the proper development of fruit and future bearing wood and for the ability to regulate each crop and size of fruit.

Cropping Capacity Depends on Bearing Surface.

The limiting factors of a tree's cropping capacity are its size and number of limbs in its framework—or in other words its bearing surface. Too much emphasis cannot be given to the need for thought in planning the pruning of individual trees from planting time to their fifth or sixth year, because it is only during this period that the frame of a tree can be built and its ultimate crop capacity established. Without sufficient and proper foundation of lower limbs no pruning or cultural method can increase the capacity of the top of a tree to give better crops. This is the period in the life of the tree when the skill of the pruner has most influence on the successful development of his trees.

When it is considered that the average production of canning peaches on the Murrumbidgee Irrigation Area during the years 1941-42 to 1946-47 was only from 2 to 4 tons per acre, it is evident that there are many trees with production so much

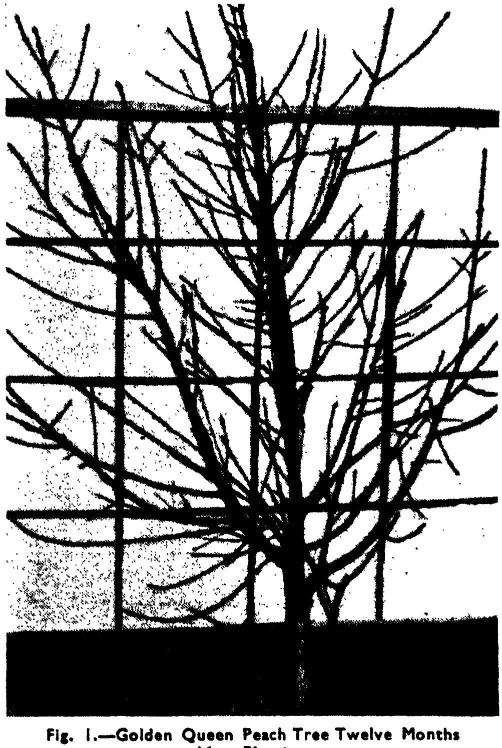

Fig. 1.—Golden Queen Peach Tree Twelve Months After Planting.

NOTE.—*The background used in the illustrations in this article is a specially designed frame, the lines on which are exactly 1 foot apart. With this background the approximate height and width of a tree can be readily determined.*

lower than this average that they are uneconomical. It is considered that faulty pruning, by failing to provide for sufficient limbs during the earlier years of the trees' life, contributed very largely to this low average production.

Effects of Hard Cutting and Limitation of Limbs.

Many growers hold the opinion that trees growing in the heavier soils should be limited to five or six limbs only, from or near the crotch, without any later subdivisions. Experience has shown however, only very light and uneconomic crops can be obtained

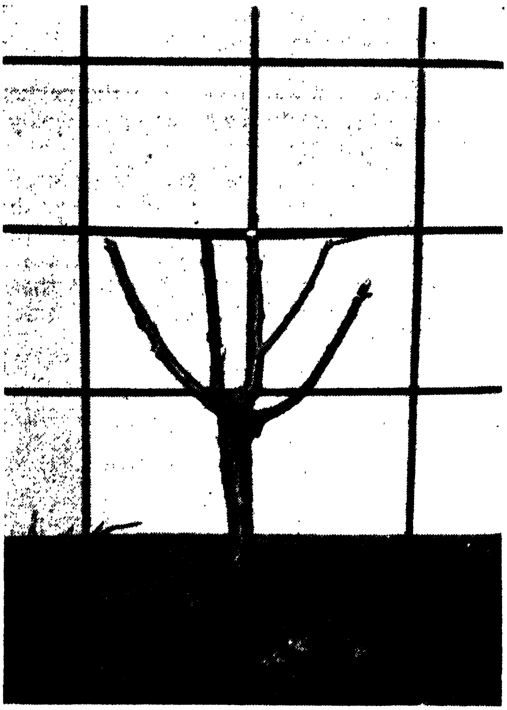

Fig. 2.—Tree shown in Fig. 1 After Pruning.

from this practice, and any attempt to carry more fruit on these few limbs will only result in more peaches below canning size, more marked fruit but no increase in the total weight of fruit from the tree. Whilst trees growing in these heavier soils cannot be expected to attain the size of those in the best soils, nevertheless their limbs should be subdivided whenever possible without overcrowding as the tree grows.

Overcrowding of limbs is a fault which will result in a general weakness of all limbs, with failure to reproduce healthy bearing wood and inability to obtain size in the fruit. Generally a space of 2 feet is sufficient between each limb, and a tree starting off with three limbs at the crotch may, when it reaches a height of 12 to 15 feet, have twenty to twenty-four limbs at the top without overcrowding.

The opinion is also held by a number of growers that the old method of annual hard cutting of the leaders induces strength in the framework of the tree. In practice it has been found that hard cutting is detrimental to a tree, and actually retards growth. It is sometimes used, in the system recommended, to check a vigorous leader so as to allow weaker, uncut ones to catch up. Hard cutting usually results in several strong shoots from the point of cutting, at the expense of lateral growth lower down the limb. At the next pruning all but one of these strong shoots will need to be cut out, thus further weakening the limb by large wounds. Under irrigation conditions canning peach trees produce very vigorous and prolific growth during their younger years, and it is considered desirable to utilise this vigour in framing the tree, rather than waste it by cutting away most of the growth each year, as well as upsetting the balance between the above-ground parts of a tree and the root system.

Although it is heard frequently that early cropping is detrimental and undesirable, hard cutting unnecessarily retards crop production by inducing only wood growth at the top of a tree, instead of good, fruit-bearing laterals along the limbs. It should be recognised that the size of a tree will determine its ability to crop, and that it is possible by the system of untipped leaders and light pruning to get a tree to a size when it is capable of producing good crops, several years earlier than one which has been annually hard pruned.

Although this article refers to winter pruning operations, it is desired to mention that a summer pruning, or what may be more correctly termed summer training, is very desirable with young trees, particularly up to their third year. Careful attention during the early summer months to the removal of strong unwanted growth and the checking of other growths likely to retard the development of selected leaders, will materially assist in the next pruning.

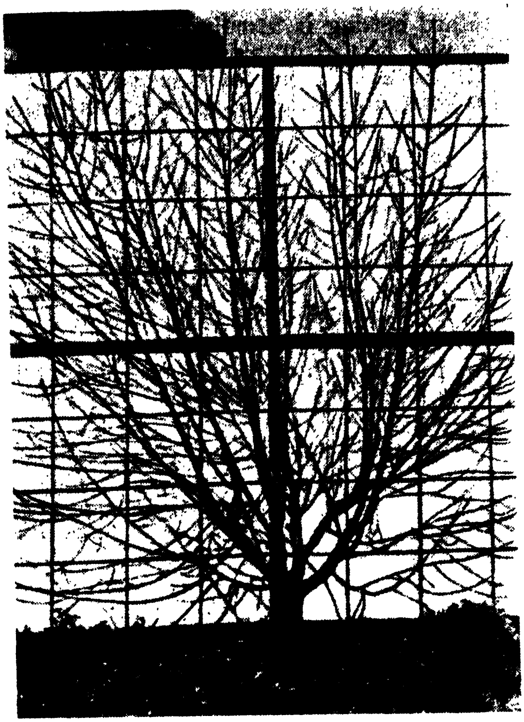

Fig. 3.—Growth Made at Two Years from Planting.

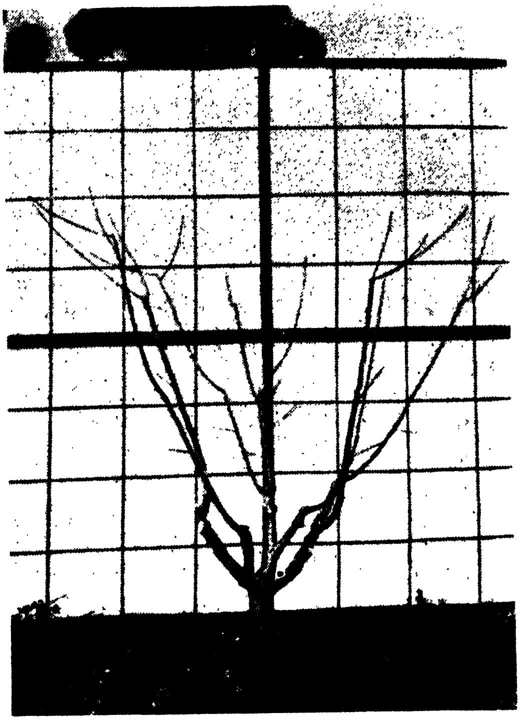

Fig. 4.—Second Pruning of Tree shown in Fig. 3.
Subdivision of leaders affected by cutting to untipped laterals

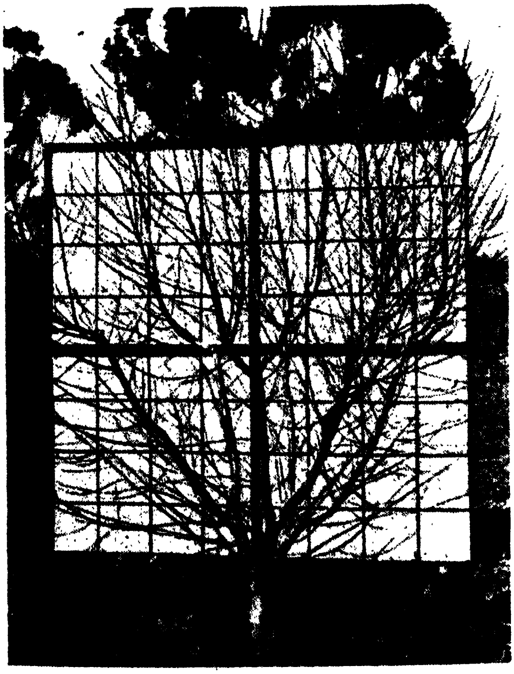

Fig. 5.—Same Tree as in Previous Figures, at Three Years from Planting.
Note growth made by untipped laterals.

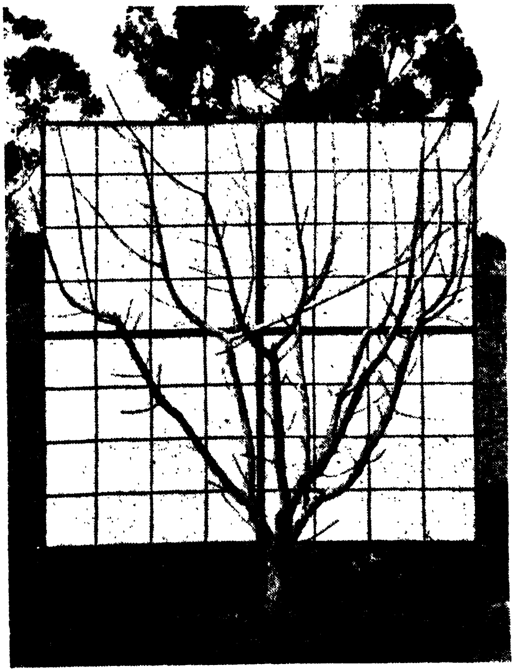

Fig. 6.—The Tree After Third Pruning.
It is capable of carrying a small crop in the following summer.

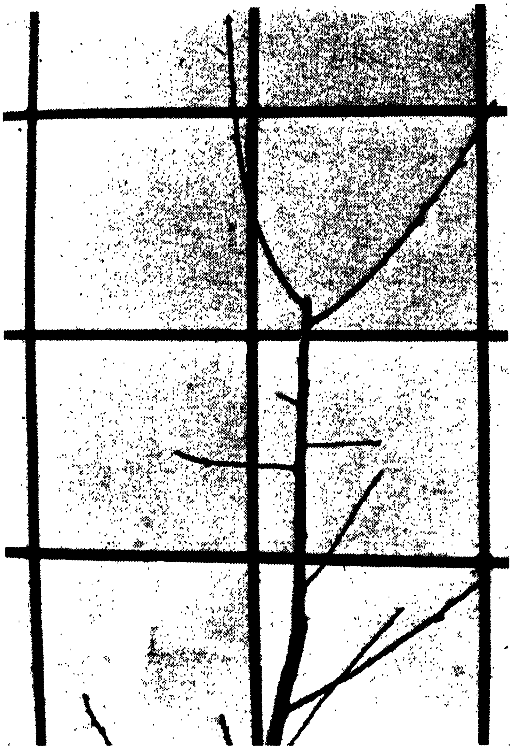

Fig. 7.—Detail of Method of Subdividing a Limb by Cutting to Untipped Laterals.

Pruning the Young Tree.

The effect of good or bad pruning during the first few years of a tree's life on its later productivity is so great that too much stress cannot be given to the need for thought before making any cut during this period. Each tree should be treated individually, and trained each year toward a shape which the pruner should visualise at the first pruning.

A young tree should receive its first training in the nursery when it is headed back, but if this has not been done or is unsatisfactory, the young tree should be cut hard at planting time to suitable buds for the formation of the main arms. Preference should be given to three buds spaced around the stem so that no two are opposite each other. Where the nursery heading is satisfactory, suitably spaced laterals should be chosen, with preference again for three, to be the future main arms of the tree. These should also be cut back hard, as hard cutting at planting is necessary to compensate for loss of roots during digging operations.

Hard cutting is usually necessary at the first and second pruning, that is when the trees have been in the orchard one and two years, to provide for proper subdivision and spread of the leaders. Where growth has been very vigorous the second pruning need not be so hard if leader subdivision and spread can be effected satisfactorily otherwise. No hard cutting of the leaders should be made at prunings subsequent to this stage; they should be left untipped except in special circumstances which will be explained later in this article. Generally when the leaders have reached a height of 5 or 6 feet, cutting of them is discontinued. (See Figs. 1 to 6).

Subdivision of the leaders should be made whenever space is available by cutting to two strong laterals which are left untipped, rather than by cutting to buds. This utilises the growth made by a tree and the length of these laterals at least has not to be made again (see Figs. 7 and 8).

It is important to give attention to the spread of the trees at their early prunings while the limbs are pliable, and to ensure that the centre is open enough to allow for

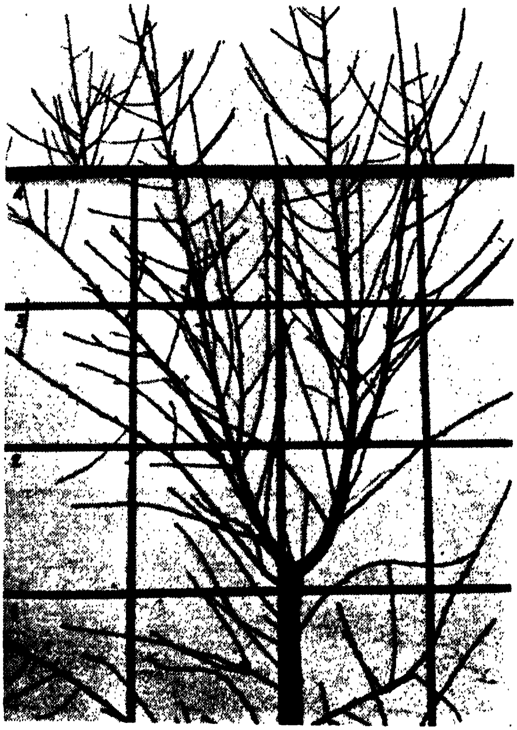

Fig. 8.—Growth Made by Limb shown in Fig. 7 during Following Twelve Months.

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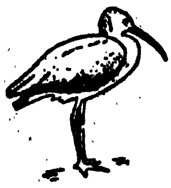

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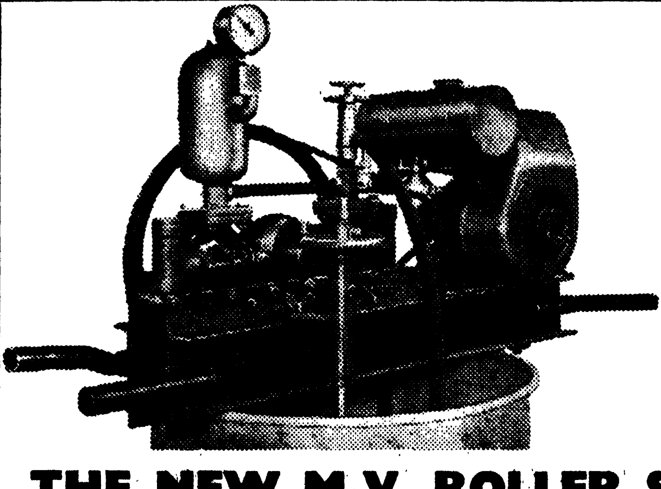

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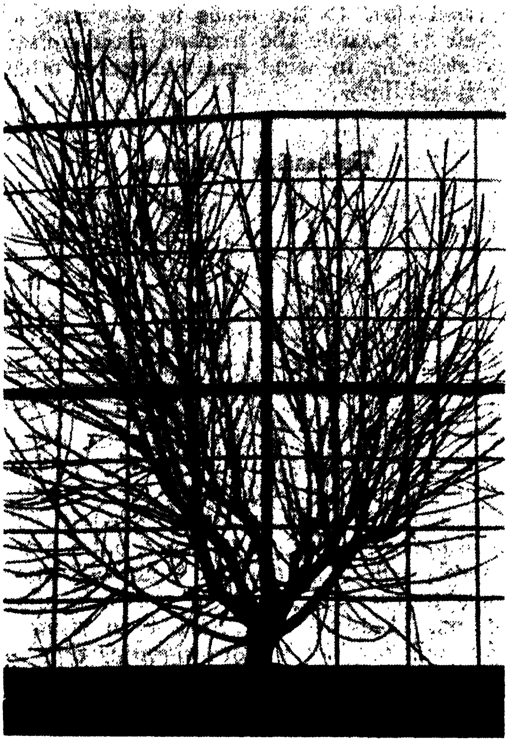

Fig. 9.—A Tree Uneven in Shape as the Result of Prevailing South-westerly Winds.

a gradual increase in the number of leaders at each pruning. It should be remembered, with strong-growing trees, that the tendency is towards upright growth, and allowance should be made to counter this by cutting to outside laterals or buds. However, when the tree commences to crop the weight of the fruit will draw the branches outwards, and if the centre is made too open a flat tree will result. A general rule is to keep the leaders inclined at about 30 degrees from the vertical.

Importance of Shape.

The greatest difficulty in shaping a young tree is likely to be experienced on the south-western or "windy" side of the tree. This side is usually the weakest and the leaders tend to grow towards the centre of the tree. This weakness and lack of spread may be corrected by leaving the leaders as long as possible on this side, or, as is very often necessary to obtain sufficient spread, by cutting back to strong outside laterals which are left untipped. The growth of the stronger leaders should be retarded by cutting fairly hard to laterals or buds which should not be higher than the weaker leaders. The vigour of the stronger limbs may be further retarded by allowing them to bear some fruit on the older wood and at the same time removing any on the weaker ones (see Figs. 9 and 10).

The use of strong, straight pieces of prunings or sticks to prop a thin, weaker limb into the required direction will be found to be very helpful.

Lateral growth in a young tree is usually abundant and vigorous, and will require to be thinned out considerably. When thinning, the very strong wood growths should be completely removed as well as a proportion of the weaker ones, the remainder being shortened back to 6 to 8 inches long. A young tree, when it commences to crop, should not be allowed to bear any fruit within at least 2 feet of the leader—in order to prevent the tops of the limbs being carried out at too great an angle by the weight of this fruit.

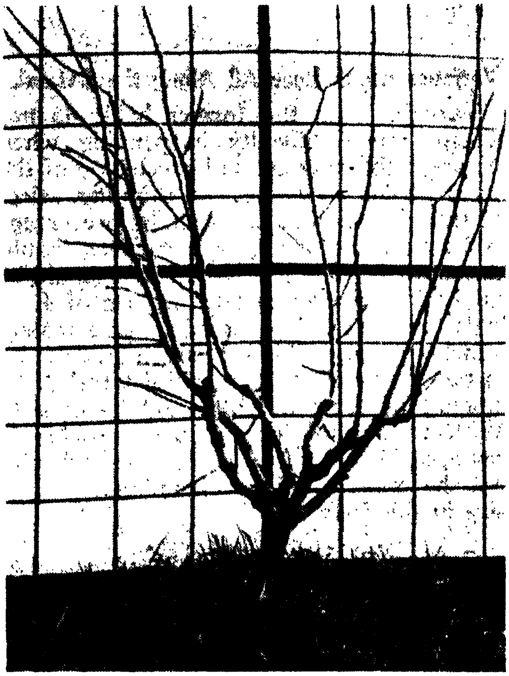

Fig. 10.—Tree shown in Fig. 9 Pruned to Correct Shape.
Strong leaders have been cut to correspond to height of weak side. Note also the fruiting laterals on strong limbs.

Pruning the Mature Tree.

When a tree has commenced to crop regularly and its fruiting habit has been established, attention to individual trees when pruning is not so important—the work is then more routine variety treatment, mainly for crop regulation. The speed of the pruner, consistent, of course, with correct cutting is important when this stage is reached.

The objects when pruning a mature tree can be briefly stated to be: (1) to assist in regulating the amount and size of fruit to be carried by the tree; (2) to make provision for the production of bearing wood for the next season's crop; and (3) to continue the growth of the tree in conformity with the shape established during its younger years.

The bearing habits of the canning peaches grown on the Murrumbidgee Irrigation Area vary—from those varieties, such as Pullars Cling and Golden Queen, which carry their fruit buds along the full length of the lateral, to varieties like Phillips Cling which are known as tip bearers, that is the fruit buds are to be found near the tips of the laterals only.

Varieties which Bear All Along the Lateral.

Varieties with the former habit do not present much difficulty in pruning when mature, a thinning out and shortening of the laterals being necessary. In thinning, select laterals of medium strength in preference to the weaker or stronger ones which should be removed. The selected laterals should be cut back to approximately six sets of fruit buds and may be spaced approximately 6 inches apart. This is a rough guide only, as the vigour of the tree will determine the amount of fruit which should be carried. With trees less vigorous more spacing is required between fruit, otherwise difficulty will be experienced in obtaining sufficient size in the fruit.

Cutting the laterals of these varieties fairly hard not only ensures that the fruit is held fairly rigidly on the tree, but that the next season's fruiting wood will also commence from near the main limb. It is generally accepted that it is very desirable for canning peaches of all varieties to be carried close to the limbs to eliminate as much as possible the marked fruit caused by swinging in wind and contacting other fruit and limbs.

Tip-bearing Varieties.

The habit of bearing fruit near the tips of the laterals only does present a problem to the pruner and the object in the case of these varieties should be to train the tree to produce very short secondary laterals to carry the crop. To commence this training, select weak laterals that are only strong enough to carry one, or at the most, two peaches. These are left untipped. Of the remainder of the stronger laterals, about 50 per cent. should be shortened to 9 or 10 inches long and the others cut hard to stubs with one or two wood buds. Rarely will fruit buds be left on the former, but shorter laterals will be produced from the wood buds to carry the crop in the succeeding season. Laterals that have been stubbed back will produce a more vigorous type of lateral which, when shortened at the next pruning, will supply the short fruiting laterals for two years ahead.

With the Phillips variety, in particular, and with most older trees of other varieties, it is difficult to induce the production of new bearing wood from the older, lower parts of a tree. The complete removal of old laterals is not recommended, but if these are cut back so that at least one wood bud is left, new growth that can be utilised for future cropping will be produced.

The leader growth of a tree will not be very vigorous once it has settled down to steady cropping, and leaders should be selected to conform with the general shape of the tree. Tipping is not necessary and subdivisions only made when space permits. Any overcrowding at the tops of a mature tree will be very much at the expense of fruit-bearing wood in the lower parts.

General Management is Important.

While it has been the endeavour in this article to show that good pruning plays an important part in orchard practice, successful orchard management requires similar care and thought in all operations to obtain the most benefit from the orchard as a unit.

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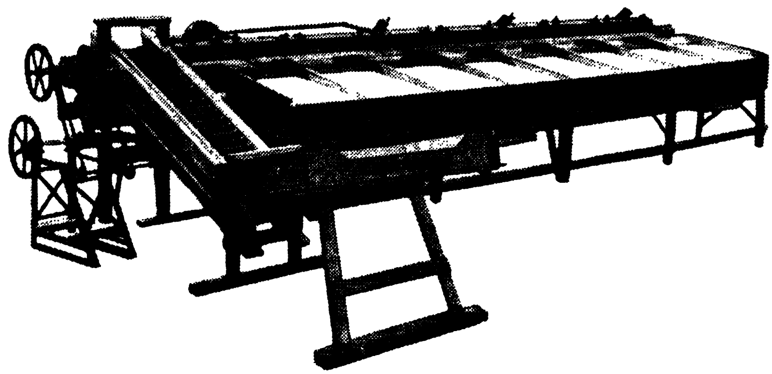

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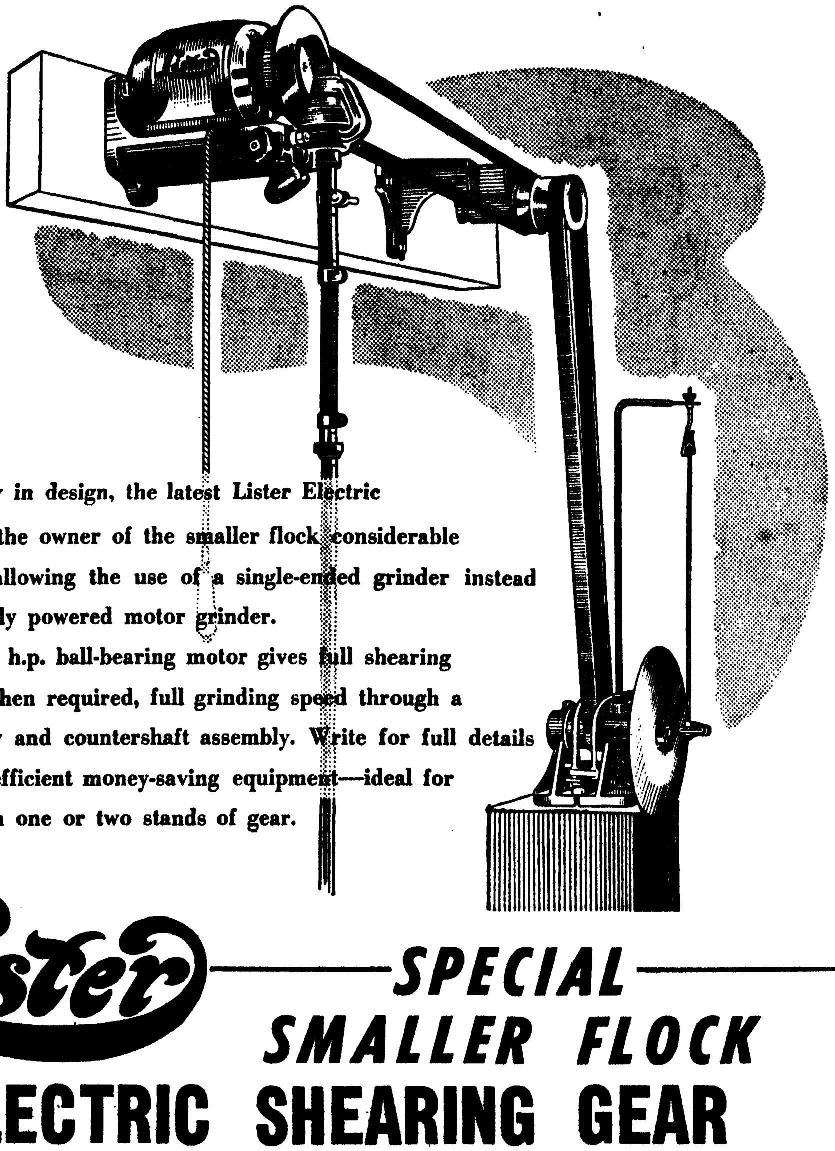

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A Notifiable Disease That Causes Considerable Losses

N. K. GOLDING, B.V.Sc., District Veterinary Officer, Cootamundra.

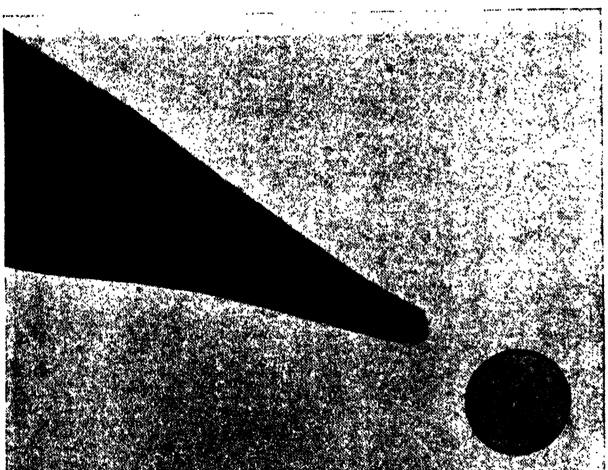
IN New South Wales infestation of sheep with any species of lice is a disease scheduled under the provisions of the Stock Diseases Act, 1923-34. Amongst other things this means that the occupier of a holding upon which are depastured any infested sheep, must notify an Inspector under the Act forthwith. Failure to carry out this provision will render the person liable to prosecution. There are other provisions in the Act by which it is an offence to sell or offer for sale or attempt to sell any diseased sheep or to travel such sheep along or across any land not occupied or owned by the owner of the stock.

Such sheep are also subject to quarantine restrictions in order to prevent them from contacting clean sheep until they are satisfactorily freed of infestation. This restriction on their movement invariably interferes with the normal husbandry and activities of the stockowner and may well involve him in considerable financial loss, quite apart from damage to the fleeces which may result from the presence of the parasites themselves.

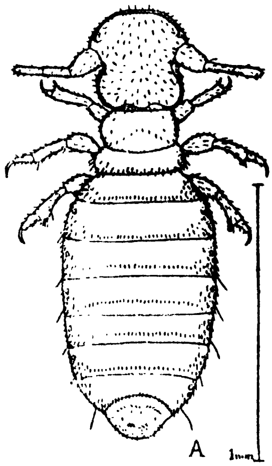
It is desirable, therefore, that anyone having anything to do with sheep should be familiar with their obligations under the Act and be able to detect early as well as the later stages of infestation when it is more readily discovered.

The Species Present.

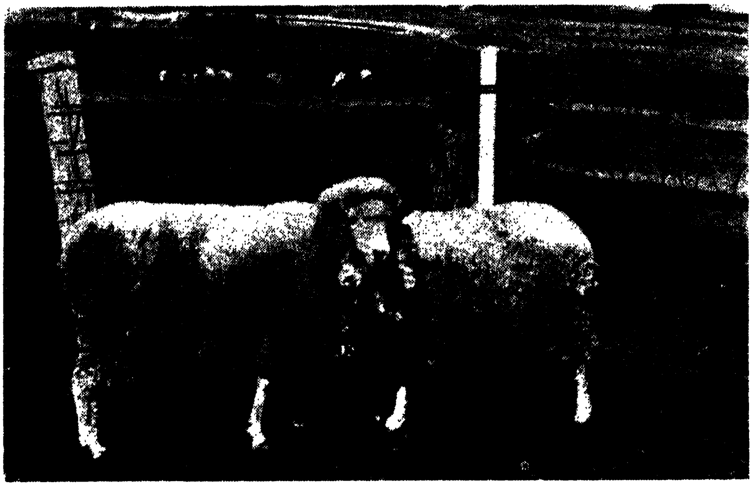
Two species of lice commonly affect sheep in this State, namely, the Body Louse (*Damalinia ovis*, formerly known as *Trichodectes sphaerocephalus* or *Bovicola ovis*), and the Foot Louse (*Linognathus pedalis*). A third species, the sucking body louse (*Haematopinus ovillus*) has been reported from time to time previously, but in recent years only the former two parasites have been noticed. Of these two, body louse is by far the more important.



Body Louse of Sheep (in circle).
Note size compared to ordinary lead pencil.



The Body Louse.
[*After Monnig.*



Sheep showing Moderate Body Lice Infestations.

THE BODY LOUSE (*Damalinia ovis*).

The body louse is widely distributed throughout the State except on the high country comprising the tablelands of the Great Dividing Range, for although infestations have occurred there they do so only rarely. On the western slopes dual infestations with body lice and keds are not uncommon. Infestations with body and foot lice are also comparatively common on the slopes and adjacent plains. The fact that lice infestation is so widely distributed throughout the State makes it imperative that sheep should be thoroughly examined periodically in order to determine whether they are infested or not.

Appearance and Habits.

The adult body louse is a very small parasite, about 1/20 inch in length, having a blunt head on a rather narrow, elongated body. It is yellowish or brown in colour and there are dark bands running across the body from side to side.

The body louse has a simple life cycle, the female laying eggs (nits) which are attached to the wool fibres by a sticky substance. The young lice hatch from the egg in about eight to ten days and a further twenty-four to twenty-six days are required to mature and lay eggs. The complete life cycle takes about thirty-four to thirty-six days.[4] The body louse normally spends all of its life on the one host and does not

Sheep Heavily Infested with Body Lice.

A Rubbing Post.
Note worn patch of grass and pieces of wool.

leave it voluntarily except to transfer to another host of the same species during a period of close contact[2]. If body lice are transferred to animals other than sheep they are unable to develop normally and soon die out.

This louse is usually found close to the skin and actively moves about among the wool fibres. It appears to favour certain parts of the body more than others, especially in early infestations, and it is common to find lice along the sides of the ribs and flank between the point of the elbow and the stifle. Other sites favoured by the lice are along the back just behind the withers and underneath the neck, but in heavy infestations they will be found practically anywhere on the body.

The parasite population in any flock varies considerably throughout the year. In the late winter and early summer there is a definite increase in lice population which appears to be solely a seasonal variation.[1] Unshorn sheep provide a more suitable environment for lice than shorn sheep, and at shearing the removal of the wool removes many of the lice and their eggs as well. Sheep which are in poor condition also seem to provide a more suitable environment for the parasite than those in good condition, a fact which is borne out by experimental work conducted recently.[5] Not all sheep in an infested flock, however, are infested to an equal degree, and particularly in light infestations it is common to find only a few affected sheep in the flock.

Therefore, when examining a flock for body lice, pick out for close individual examination, those sheep which have the longest wool and which are poorest in condition, unless the other more definite signs described later are present. When making individual examination it is important to part the wool in several places over each of the sites preferred by the lice, right down to the skin, and to expose the parted wool to bright light, otherwise it is practically impossible to detect a light infestation which may be present. Those who require glasses for reading should use them, or a magnifying glass, when searching for lice. If present, the lice will be seen moving about near the base of the staple.

Effects of Lice Infestation.

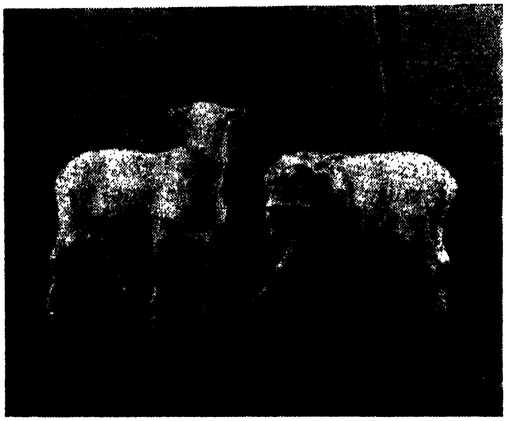
The body louse feeds on debris from the skin and crawls about actively among the wool fibres in search of it. At times the parasite bites the skin and causes a local irritation which the animal endeavours to relieve by biting or scratching with the hind limbs or rubbing against any solid objects which may be present.

Where the infestation is light very little abnormality is noticed in the wool or in the behaviour of the sheep unless it has a particularly sensitive skin, a few lice simply being found on examination. In heavier infestations, however, and in animals with sensitive skins, the irritation is much more frequent and the wool presents a ragged appearance and may be plucked or knotted

Another Rubbing Post.
Note polished trunk.

as the result of the animal rubbing or scratching to relieve itself. In very heavy infestations the animal has a dejected appearance and the wool may be completely shed from the lower portions of the body. The skin on these areas is scurfy and sores may be produced by the continual rubbing and scratching. At this stage lice will be found practically anywhere on the body. In heavy infestations the wool has a peculiar pungent and disagreeable odour which is readily recognised once it has been noticed.

Fence posts, stumps, trunks of trees and logs assume a shiny appearance and may have pieces of wool attached to them or scattered about nearby as a result of the continual rubbing of the sheep.



Sheep Biting at Skin.
A symptom of body lice infestation.

Control.

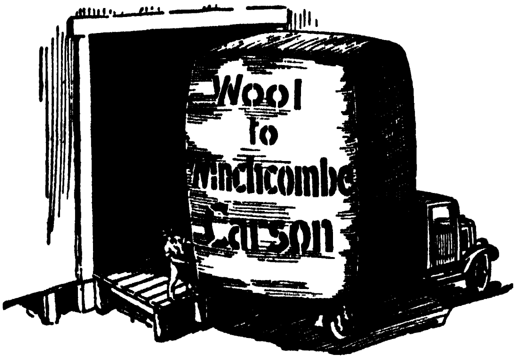
The necessity for control is evident when the losses associated with the presence of this parasite in a flock are considered. Light infestations have little effect on the fleece, but the heavier the infestation the greater the actual damage to the fleece—which is thereby decreased in value to a corresponding degree. The quarantine restrictions required by law usually interfere with the normal activities, by preventing disposal of the sheep through normal channels. Finally, movement of sheep to other States and countries is very often contingent upon their being free from infestation.

There is only one satisfactory method of controlling lice infestation in sheep, and that is by dipping the whole flock in a medicament which will destroy the lice. There are a considerable number of proprietary materials on the market, but the great majority of them depend on arsenic or rotenone (contained in derris root), or combinations of these, for their effects, while phenols are also not uncommon ingredients. Rotenone, however, is not very effective against lice in the concentration normally used.

Of the materials commonly used arsenic is by far the most reliable because it is a poison which kills by contact or after it is eaten by lice feeding on arsenic-contaminated debris on the skin. In this way it usually retains sufficient residual activity, after dipping, to kill any young lice hatching from eggs; a single satisfactory dipping should be sufficient to eliminate infestation from a flock.

The new insecticides commonly known as DDT and BHC (benzine hexachloride) have recently been used with marked success, provided that precautions are taken to prevent the growth of harmful germs in the dipping fluid after it has been made up. These usually develop only after the dip has been standing and, therefore, if fresh materials are used each day there is little danger of any untoward happenings following dipping. In some of the benzine hexachloride dips, bluestone (copper sulphate) in very dilute solution is now used. In the concentration recommended the bluestone does not stain the wool but merely prevents the growth, in the dip, of the germ which causes lameness and loss of condition in sheep. The products themselves in the concentrations used are completely non-toxic to sheep, and all the usual hazards of scalding with loss of wool and actual deaths occurring from absorption of arsenic are entirely eliminated.

Dipping may be carried out by using a plunge dip or a spray dip, the main requirements being that each sheep must be thoroughly wetted with the dipping fluid. If a plunge dip is used, the swim should be sufficiently long to enable the animals to be completely immersed twice during their swim. If a spray dip is used it should be fitted with belly sprays as well as overhead sprays and the sheep should be retained in the enclosure long enough to receive a thorough soaking. Frequent inspections of the nozzles are necessary to ensure that they remain free.



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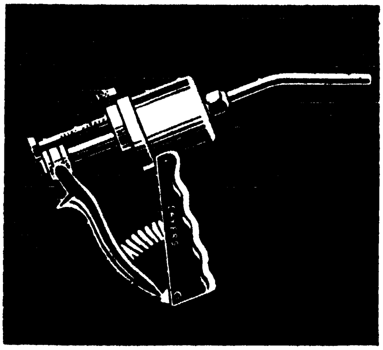

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It is best to dip sheep as soon as shearing cuts have healed and before the wool has grown long enough to prevent thorough wetting. If the sheep are not completely wetted, lice can survive and will reinfest the flock, so that the whole operation then serves merely as a check to the infestation. With BHC and DDT dips it is a good plan to put the first few sheep through the dip twice as the wetting power of the dip is improved very rapidly after the first few animals have passed through it.

Another factor which has been found to be of importance in securing a suitable dipping is the maintenance of an effective dipping strength in the fluid used. When some of the newer dips such as BHC and DDT are mixed with water, they form an emulsion or suspension, and when sheep are dipped in these fluids they take out more of the BHC or DDT than they do water, thus stripping out the insecticide from the dipping fluid. By this means the strength of the fluid may even reach a figure below its effective level[1].

This reduction in strength is more noticeable when the volume of the fluid in the dip is small, so that spray dips are more likely to be stripped out than the plunge dips, where a greater volume of fluid is used. This stripping out factor, however, can be overcome by adding a slightly increased quantity of the concentrate, related to the number of sheep already dipped when the fluid in the dip is replenished. If replenishment is necessary in this way the manufacturers include directions for adding whatever additional concentrate is required.

Other precautions to be taken during dipping and details of the construction of dips may be obtained from the departmental pamphlet "Sheep Dips and Dipping."

Prevention.

The main reasons why lice infestation persists in a flock from year to year, however, in spite of annual dippings, are the failure to secure a complete wetting or to dip every sheep on the property in the one operation. It is not uncommon to find that no attempt is made to wet rams' heads where the horns will not fit down in the dip, and it is not uncommon also to find that some of the sheep on the property are not dipped, *e.g.*, lambs may not be dipped when the main flock is dipped, but some months later. Pet lambs also frequently escape dipping with the main flock.

It should be remembered, too, that in theory at least, it is quite possible for infestation to be transmitted from an infested environment to a clean flock using it. Detached wool in sheds and yards, for example, can be looked upon as a possible source of infestation for periods up to a fortnight, depending on the atmospheric conditions prevailing. Lice are often transferred temporarily on to the clothes of shearers and other persons handling infested sheep, and this constitutes another possible method of infesting clean sheep.

If lice infestation is eliminated by satisfactory dipping the flock will remain clean unless it comes into contact with other infested sheep or surroundings, after the residual effect of the dip has subsided. If such contact could be avoided indefinitely there would be no necessity for further dipping, and the flock would remain uninfested as long as such a happy state existed. In practice, however, especially where the holding fronts a road or where introductions to the property are made from time to time, the opportunity for reinfestation is so great that it pays to dip the flock every year as a precautionary measure. It has been found that when the annual dipping has been missed for some reason or other, lice have been discovered on the sheep at the succeeding shearing.

THE FOOT LOUSE (*Linognathus pedalis*).

This louse is fairly widely distributed throughout the State but is mainly found in the eastern portion.[3]

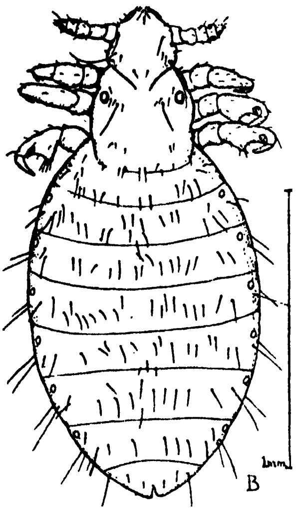
Appearance and Habits.

The adult foot louse is a very small parasite, having a narrow, pointed head and a much larger, oval-shaped body, about the size of a pin head, which is usually blue-grey in colour. It feeds by burying its pointed head into the skin of its host and sucking blood. This is responsible for the colour of the body of this louse.

This louse does not move about actively as does the body louse, but remains in the one position for longer periods. It is found almost solely on the hairy regions of the sheep's legs—about the coronet and dew

claws—but on occasions infestation spreads upwards and may even involve the purse (scrotum) or the udder as the case may be. In very heavy infestations lice will spread into the woolled areas and even along the belly.

The number of lice present is usually small, and it is common to find many sheep in an infested flock with only a few lice on them in their favoured situations. Sometimes only one leg is involved. Infestation appears to be more common on hind legs than on the fore legs. Not all sheep are infested to an equal degree, and the degree



Foot Louse of Sheep.
[*After Monnig.*

varies from year to year. On most occasions the louse population is small, but sometimes, for some reason or other not understood, a comparatively sudden increase is observed with the parasite extending upwards on to other parts of the body mentioned above. This increase usually diminishes again to its former low level, even in the absence of treatment.

When examining sheep for foot lice, the hairs over the coronet and about the dew claws should be brushed back lightly with the fingers or a sharp-pointed instrument, and the skin exposed to bright daylight. The parasites are easily confused, in a casual examination, with small portions of plants which are nearly always found in these locations. The life cycle is somewhat similar to that of the body louse, but the adult lice can be kept at room temperature off the host for a much longer period—periods up to three weeks having been recorded.[6] This fact is evidently of importance in the transmission of the parasite from sheep to sheep, for the opportunities for spread by actual contact with other sheep must be very limited indeed. It has been possible to demonstrate experimentally that contamination of the pastures with foot lice will result in the infestation of clean sheep, and it seems, therefore, that this is a probable method of spread under natural conditions.[6]

Effects of Foot Lice Infestation.

The action of the foot louse in burying its head into the skin of the sheep preparatory to sucking blood causes an irritation which may make the sheep stamp its feet and bite at the part. Light infestations, however, do not cause any appreciable damage or change in the sheep's habits. In heavy infestations, where other areas of the body are involved extensively, the masses of nits produced and possibly local irritation with the escape of tissue fluids result in the formation of crusts and scabs over the sites of infestation.

In general, the effects on the sheep of foot lice are much less than those of body lice, and even heavy infestations often appear to cause little or no irritation to the sheep. It does not multiply and spread throughout a flock with such rapidity as does the body louse.

Control.

Using benzene hexachloride at the strength normally recommended for body lice, it is possible to cleanse sheep of infestation, but it appears that the effects of the dip are not sufficient to last over the complete life cycle and unless sheep can be moved to a clean paddock after treatment reinfestation will occur.[7]

Medicaments previously used were very strong concentrations of derris root and, in sheep being treated individually, dilute solutions of nicotine sulphate (Blackleaf 40). However, benzene hexachloride appears to be more efficient than either of these materials and as it can be used for ordinary dipping to control body lice it is much more satisfactory than either of the other two substances.

(*Continued on page* 334.)

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BEEKEEPING HINTS

The Formulation of DISEASE CONTROL POLICY With Special Reference to Diseases of Bees*

D. L. MORISON, B.V.Sc., Apiary Branch.

IN view of recent comment by beekeepers, both local and overseas, especially on the sulphathiazole treatment of American Foul Brood, it is considered desirable to discuss at some length certain aspects of bee disease control policy. It is considered that if beekeepers are better informed of reasons for measures taken for control of disease, there is a greater likelihood of enlisting their co-operation.

In this article consideration is given to some of the factors which the appropriate authority must take into account when formulating disease control measures, whether the disease be in bees or some other species.

When a New Disease is Introduced.

When a serious disease not already present in a country is introduced by some means, immediate and drastic action is required. Such was necessary when swine fever was introduced into Australia some years ago. All infected piggeries were immediately quarantined, and all pigs on these holdings were immediately destroyed by shooting and either burning or boiling down. Quarantine was maintained until it was considered that the virus was no longer dangerous. Approximately 10,000 pigs were destroyed in New South Wales in this outbreak, but the disease was eradicated.

Though this initial loss may appear large the drastic initial steps taken were justified in view of the much greater and continuing loss which would have been suffered from this disease had it been allowed to become established.

Such a policy would be necessary should a disease such as Acarine disease of bees be introduced into this country. It is probable that the entire apiary or apiaries affected would have to be destroyed. This prospect should deter any person from attempting to import queen bees illegally from countries where Acarine disease is known to exist.

Control of Disease Which Has Been Present for a Considerable Period.

When a disease has become widespread and firmly established control becomes somewhat complicated.

Of course, complete eradication of a disease is the ideal—to be achieved if possible. However, this may not prove practicable (though it may ultimately be achieved) owing to the following:—

Technical Difficulties.

There may not be sufficient trained men nor adequate materials available to implement an intended disease control programme, or external factors, such as repercussions of the intended action on other industries, may limit procedure. The lack of sufficient trained inspectors has hampered control work with American Foul Brood disease of bees.

Economic Considerations.

At times the destruction involved in an eradication campaign may be so great that the original plan has to be greatly modified or an intended campaign may have to be deferred or abandoned for this reason.

The slaughter of cattle in the Foot and Mouth disease eradication campaign in Mexico was so great that the original control policy had to be modified.

During recent years there has been much agitation (especially in the United States of America) for the abandonment of the policy of burning hives and colonies of bees in the

* A previous article bearing on the above subject was published in June, 1946, issue of the Agricultural Gazette of N.S.W.

control of American Foul Brood, in favour of the sulphathiazole treament, to which further reference is made later in this article.

The Human Element.

Probably the commonest cause of resistance offered to disease-control measures is the economic loss and inconvenience caused by such measures. It was for this reason that a compensation scheme was introduced in connection with American Foul Brood disease of bees in New South Wales.

On occasions opposition is encountered as the result of imagined grievances and because of lack of knowledge. It is certain that the human element has played a very important part in control (and lack of control) of American Foul Brood disease of bees. The disease present in this State today is largely a legacy left to us by the ignorant, the careless and the physically incapable, as well as unco-operative members of the bee-keeping fraternity of the past. No doubt those at present amongst us who could be grouped in the above categories will contribute in large measure to the American Foul Brood disease of the future.

Owing to the longevity of the spores of *Bacillus larvae,* the mistakes of the past greatly influence policy in relation to present and future control of this disease. Even the mode of life of the owner and methods of management of the bees (for example, in migratory methods) may require consideration.

Some individuals may have a vested interest in some control measure which is used in disease minimisation and not wish to see complete eradication.

The Nature of the Disease Agent.

In consideration of the influence of the nature of the causal organism of a disease it is important whether the organism is capable of independent existence away from the species it affects. Those which are not capable of independent existence are more easily dealt with. Spore-forming organisms are particularly difficult to deal with, as the spores may live for considerable periods—and this is the main trouble with American Foul Brood.

With the exception of some minor conditions, such as aspergillosis (which is only a very occasional pathogen of bees), diseases of bees do not appear to be transmitted to other species. However, one special difficulty exists in that commercial bees (*Apis mellifica*) gone wild, may constitute a natural reservoir of diseases.

Geographical Influences.

Australia is fortunate in some ways that she is separated by wide oceans from certain other countries, for such distances constitute a formidable geographical barrier to disease. During recent years, however, this value has been appreciably reduced by modern development in transportation, especially in the air. All queen bees imported into Australia now come by plane and special quarantine provisions must be observed before they can be released.

Some parts of Australia are relatively rough and undeveloped, and this imposes limitations in the control of diseases, for example, pluero pneumonia of cattle, in the North of Australia, and AFB disease of bees in the southern highlands of New South Wales. AFB-infected colonies of bees in trees in some southern highlands districts constitute a natural reservoir of disease of some significance.

Should an area in which disease is present be close to other areas in which the disease is likely to persist, then this proximity of disease, with the possibility of reintroduction and perhaps a violent epidemic, may act as a deterrent to attemps to eradicate in the area first mentioned.

Trends in the Industry.

Owing to the fact that the beekeeping industry in New South Wales has practically doubled in the past ten years, it will become increasingly necessary to exercise vigilance in disease control.

Any marked decrease in the size of an industry will logically result in less attention being given to disease control. For example, the recent advances in farm mechanisation will result in diseases of horses assuming less total significance.

The Minimisation of Disease.

At times the results obtained by control measures decrease so markedly as a disease control campaign progresses, that eradication proves to be a practical impossibility and only minimisation is practicable.

If it is realised that some factor or factors prevents eradication of disease or renders its eradication undesirable for some reason, then minimisation must be considered.

This often entails the division of affected areas into sections for quarantine purposes, according to the distribution of the disease, geographical limitations, etc., and may entail destruction of infected stock and materials, perhaps with the application of preventive measures such as disinfection, vaccination, etc., depending upon circumstances.

Control of AFB Disease by Use of Sulphathiazole.

Increasing interest is being taken in the treatment of certain diseases with drugs. Much has been said of the use of sulphathiazole in the treatment of American Foul Brood disease of bees, especially in the United States of America. The arguments for and against the use of this drug have been long and complex. However, its use is *not* recommended against AFB in Australia for the following reasons:—

1. *The Economic Aspect.*—If all colonies of bees in New South Wales were fed sulphathiazole at the rate of 2 grams per year, the cost would be about 5d. per colony for sulphathiazole, or a total of over £3,000 per annum for sulphathiazole for all colonies in New South Wales. This amount is greatly in excess of the value of colonies and material burnt on account of AFB in this State each year.

2. *The Possibility of Further Spread per Medium of Spores.*—Sulphathiazole merely checks the vegetative growth of *Bacillus larvae*; it does not kill the spores. Hence material from apparently cured colonies could cause the disease if placed in other healthy colonies. The aim in control of this disease is to eliminate latent infection, rather than create it.

3. *The Possibility of Sulphathiazole-resistant Strains of Bacillus larvae.*—After sulphathiazole had been in use for some time it is quite possible that strains of *Bacillus larvae* would arise that could develop in the presence of a fairly high concentration of the drug.

Should spread by spores and development of resistant strains occur concurrently, the catastrophic results can well be imagined.

Special Uses of Sulphathiazole.—It is admitted that the use of sulphathiazole in AFB control may be desirable under special circumstances, as, for example, in a country where the ravages of AFB are so severe that bees could not otherwise be kept, or perhaps in conjunction with the "shaking" treatment for American Foul Brood control. However, any such concessions, if granted by a disease control authority, would probably be abused by careless beekeepers. Moreover, it is evident that sulphathiazole could be used to camouflage AFB disease in infected apiaries offered for sale—and some beekeepers may avail themselves of this subterfuge.

Burning a Diseased Hive.

While there does not appear to be any case for the use of sulphathiazole in AFB control in this State, it may be that some of the sulpha drugs will ultimately be of use in such diseases as that caused by the protozoan Nosema apis.

Research in the chemistry of anti-bacterial substances has placed some powerful weapons in the hands of disease control workers. However, there is far too great a tendency for some people to

regard some of the newer drugs as "cure-alls," whereas most of them have strict limitations and must be used rationally for best results.

Incidence of AFB Disease in N.S.W.

In New South Wales the incidence of AFB is fairly low—about 1 colony per 1,000 per year. In some other countries, such as the United States of America, it is many times greater.

The disease appears to be more persistent in cooler climates. In New South Wales it is most persistent on the southern highlands, whereas Queensland appears to be free from it. It is interesting to note that *Bacillus larvae* and *Bacillus anthracis* (the causal organism of anthrax), are very similar in their morphological and cultural characteristics, and that no anthrax occurs in Queensland.

However AFB disease may develop in warmer climates, since AFB material taken recently on to the North Coast of New South Wales (where conditions are semi-tropical), caused the disease when bees were placed in it, and the disease made rapid progress until preventive measures were taken.

Value of Sound Administration of a Considered Policy.

While the above cannot be considered a complete discussion on factors influencing disease control measures, it will indicate that the policy of the disease control authority is not decided upon haphazardly, but rather according to a set plan after a thorough and systematic consideration of the facts available.

At times, of course, new developments may necessitate an alteration of policy; the approach to these may be conservative, but a careful examination of the full implications of the intended step is made before it is taken.

Disease control authorities may have to act quickly at times; however, they cannot allow themselves to be stampeded into precipitate action by any person who has some particular axe to grind or pet theory to satisfy.

Very often a disease control measure which is considered best in one area under one particular set of conditions may not prove best elsewhere, and some persons are apt to agitate for, and give evidence on, certain measures to counter a disease in a country or district when they have little or no knowledge of local circumstances.

While disease control authorities are not infallible, the rigid administration of a considered policy is the most effective counter to disease and the most effective sealer of loop-holes through which it may infiltrate.

Quarantine Inspections Prevent Introduction of Overseas Pests.

A NUMBER of plants and bulbs imported recently from overseas countries were found during recent quarantine examination to be affected by diseases and pests which do not occur here.

On many occasions plants were found infested with eggs of the European red mite, a pest which is unknown in Australia, and some trees were found infested with aphids of an unknown species.

In all these cases the plants were covered by certificates from the country of origin. The Department has, therefore, taken up the matter with the Director-General of Health with a view to having the inspection service of the country concerned improved and tightened up.

Introduction of another pest unknown in Australia, a species of Sirex (Wasp Borer), was prevented when a case of furniture from Czechoslovakia was intercepted. This borer, which is quite a large specimen, had infested case material. The timber in question was destroyed.—DIVISION OF HORTICULTURE.

BETTER and heavier feeding means increased expenditure on pasture improvement, fodder crop production and concentrates, and it might be argued that the increased production may not pay. But although higher production definitely requires more feed, the amount of feed required *per gallon* and therefore *the cost of production per gallon* is less. That is, high-producing cattle convert feed to milk more efficiently than do low-producing cattle.

For example, a 4-gallon cow requires about one and a half times as much feed as a 2-gallon cow, but produces twice as much milk. In an American farm survey it was found that the cost of feeding cattle on farms producing 250 lb. of butter-fat per cow was one and a half times the cost of feeding cattle on farms with an average of 150 lb. However, on the 250-lb. farms the net return, that is, gross returns minus feed costs, was *four times greater* than on the 150-lb. farms.

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POULTRY NOTES

SOME PROBLEMS OF COCKEREL RAISING

A Plea for Better Quality

V. H. BRANN,
Livestock Officer (Poultry).

Australorp Capons, Seven Months Old, Weighing 6½ to 8½ lb.

THE present indications are that a record number of cockerels will be reared this season, both by free range and battery methods.

Both systems have advantages—the former when raising cockerels to a prime weight—the latter in saving labour, and in enabling the production of large numbers of cockerels on a very small area with comparative immunity to the parasitic diseases which persistently occur on overstocked or overcrowded land.

Battery rearing is a system primarily adopted for the raising of chickens to the griller stage—or 2½ to 2¾ lb. in weight at from ten to twelve weeks of age. Batteries are being widely employed (and with a high degree of success) for raising cockerels for export or over 3½ lb. in weight.

Keeping cockerels to about sixteen weeks of age in batteries increases the difficulties commonly associated with battery rearing. In the first place, the numbers in the cages have to be reduced more often than otherwise at various stages of development to prevent overcrowding and losses from cannibalism; secondly, the cages must be designed to accommodate larger cockerels as well as for small six-weeks-old chickens.

The Prevalence of Breast Blisters.

In the final stages, just prior to marketing, there is an increasing prevalence of what are termed breast "blisters" or "bursae," which show as ugly, fluid-filled abscesses on the breasts of cockerels. These blisters do not affect the health of the birds, but depreciate the appearance and value of the carcase, both for local and export demand. Breast blisters are by no means confined to battery rearing alone. In fact, there is no definite evidence yet to indicate that this defect is more common in battery than in range-reared cockerels.

Examination of White Leghorn and Leghorn-cross breeds shows that a very small percentage of birds become affected. Australorps, Rhode Island Reds and other heavy breeds are particularly susceptible. An increasing number of the more experienced cockerel raisers contend that Leghorn-cross breeds are easily the most satisfactory and adaptable birds for rearing in cages.

Some American work indicates that breast blisters are more prevalent among slow-feathering strains of birds. There

appears to be little doubt that fast-feathering strains in all breeds are desirable for the production of prime table poultry, not only to decrease the number affected with breast blisters, but also to improve the carcase appearance

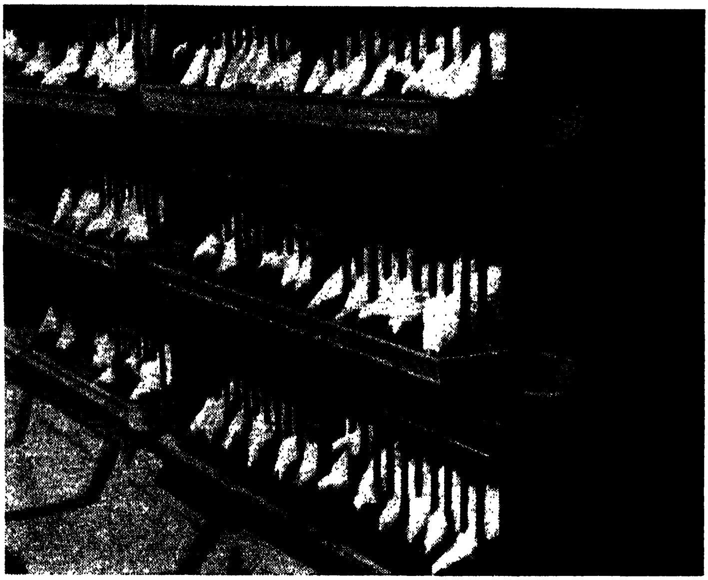
In this regard, Knox and Gordon*, of the United States of America Department of Agriculture, state: "Fast-feathering stock is desirable for meat production because chicks from such stock have a minimum of pin feathers at broiler and fryer age when chickens are killed and dressed. If there are too many pin feathers, the carcase appears untidy and poorly dressed. Such birds usually bring from 2 to 4 cents a pound less than birds properly dressed.

"Selection to obtain breeders that feather rapidly is most easily accomplished at the time of hatching.

"Fast feathering is a sex-linked recessive to slow feathering, hence when mated together male and female breeding birds selected for fast feathering will produce fast feathering chicks. Rate of feathering can be determined in day-old chicks, by the length of the primary and secondary (wing) feather sheaths. The chick with highest rate has well-developed primaries and secondaries. The next best has six or more secondaries which are not so well developed but are approximately as long as the primaries.

"The chick of slow feathering type has no secondaries or less than six short ones and no primaries or very short ones."

A high proportion of our Australorp and Rhode Island Red strains are mainly slow feathering and could account for the large number of cockerels affected with breast blisters. This early phase in the selection of stud stock is one that is practically neglected. However, it emphasises the large amount of work that still has to be done to improve carcase quality.



Cockerels in a Three-tier Battery Cage.

The Wet Cooling Process of Dressing.

The production of cockerels to the griller stage for which, as already stated, batteries are mainly used, is very much restricted because of lack of demand. The small, tender carcase, the high cost of preparation and the comparatively lower values for these chickens are the main reasons why there is almost a complete absence of grilled chicken in the Australian diet.

The only time when there is any particular demand for grillers is during August and the early spring, when there usually is a shortage of both cockerels and boilers on the market.

* Leaflet 233, U.S.A. Department of Agriculture, "Selecting Breeding Stock for Broiler Production."

Overseas visitors invariably complain of the poor quality of grillers here, and ask for reasons why they are in such short supply. Unfortunately, most of the grillers sold through the retail trade are nothing more than stunted or backward pullets, perhaps eight to ten months old, that have been culled from laying flocks, and these birds cannot be compared in succulence or flavour to a quickly-grown twelve-weeks-old chicken.

It is necessary to scald grillers at a temperature of at least 138 deg. Fahr. to facilitate plucking. When the carcases are exposed to the air they become discoloured and of very poor appearance due to the destruction of surface skin and uneven evaporation of moisture from the bird. Dry plucking or a light semi-scald plucking prevents this discolouration, but these methods are too costly and too difficult for the treatment of young chickens.

In America, where millions of these "broilers" are consumed each year, the problem was solved by wet cooling.

temperature of the water is maintained at 33 deg. Fahr. After plucking, poultry can be immersed in the water for a period of one hour, during which time it is cooled to within a few degrees of the water temperature. After this time the carcases may be stored at a temperature of 35 deg. with a relative humidity at close to saturation point until marketed.

The advantages claimed by this method are:

(1) The poultry actually gains weight instead of losing weight during the cooling and storage period;

(2) The birds cooled by the wet method have a better market appearance with less discolouration due to the scalding, than dry-cooled birds;

(3) The wet-cooled birds are easier to draw; and

(4) The rate of cooling is much more rapid.

Australorp Grillers

The following is a summary of results of investigations carried out by Roberts and Robertson*, as far back as 1941:—

In addition to the method of dry cooling poultry under refrigeration, a water method of cooling has been introduced during the past year. This method consists essentially of an insulated tank filled with water which has been refrigerated to a point where the

The wet storage cooler recommended for the small producer is a wet-type milk cooler.

The refrigerating coils are located around the edge of the cooling box, which is filled with water, and an ice bank is built up around the cooling coils. This ice bank provides a reserve of refrigeration during the cooling period and maintains the water at a constant temperature. The water is agitated to facilitate rapid cooling.

*Bulletin 403, State College of Washington, "A Comparison of Wet and Dry Cooling of Dressed Poultry."

Should More Capons be Reared?

The rearing of cockerels to a prime age or to an age about six months must also be given an important place in the development of the growing table poultry industry.

Capons, which constitute the primest of all poultry, have never been raised in large numbers. The various reasons that have been given in past years are: (1) The growing of capons to a prime age (8 to 10 months) increases the cost of production to a point that makes rearing capons uneconomic; (2) if the capons are sold at a much younger age there is little if any advantage gained by caponising; and (3) there is a complete lack of appreciation by Australian consumers of the superior quality of capon flesh.

The position has changed by the export demand and the brighter outlook generally for table poultry. When poultry are being exported by private negotiation and at competitive rates, good capons will surely find a ready market even when there is a buyers' market for boilers and small cockerels. Because of their large size and plump carcase, capons are comparatively cheap to process and make the most attractive packs of poultry.

On the producer's side there is no definite evidence that raising capons would be less profitable compared with birds of a similar weight and, of course, a greater number of smaller cockerels. A farmer who can consistently maintain a growth rate of 1 lb. per month in the chickens he raises would be highly successful, and would receive a good return over food costs for labour and outlay. A good heavy breed capon should easily weigh 8 lb. at 8 months of age. In addition, buyers would probably pay premium rates for prime capons if sufficient were obtainable to pack for export.

Although no experimental data is available it is fairly definite from experience that capons eat actually less food and require less protein than growing cockerels three to four months old. In other words, one capon weighing 8 lb. would require less food than two cockerels reared to a weight of 4 lb. each. Less rearing equipment would be required and there would be a lower cost if day-old chickens had to be purchased.

Some consideration would have to be given to seasonal fluctuation in values, but during recent years prime poultry have been realising stable rates for most of the year.

Capons could not be raised satisfactorily in batteries, at least during the later stages of growth. Heavy breeds would be required where free range is available. They could, however, be kept in intensive houses if necessary.

It would appear that the slower return by keeping these birds for a larger period, and more particularly, the lack of skilled personnel to do the caponising, are the only reasons why more capons are not reared.

Future Prospects.

Because of the obvious advantages it should not be necessary to encourage the raising of table poultry of the best possible quality and the exploiting of all avenues of the best methods of production. The continued prosperity of the table poultry industry will, in time to come, depend upon the reputation gained by the types and quality of poultry sent overseas now. The success or failure of this venture rests with the producers, as well as the packers.

Protein Content of Poultry Food.

Regulations Gazetted Under Stock Foods Act.

REGULATIONS covering minimum protein content of chicken and adult mashes have been gazetted under the Stock Foods and medicines Act.

These regulations provide that any battery mashes must have a minimum protein content of 18 per cent., while other chicken mashes must have a protein content of 20 per cent.

Laying mashes must have a protein centent of at least 16 per cent.

The regulations will come into force on 1st July, 1949, when registrations are due for renewal.
—DIVISION OF ANIMAL INDUSTRY.

Your Co-operation is Requested

Every month people are prosecuted for breaches of the Railway By-laws relating to trespassing on railway property and to smoking in non-smoking compartments.

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As smoking is allowed in approximately 75 per cent. of all train accommodation, it is expected that those who desire to smoke during their journeys should keep to the parts of the train allotted for the purpose. Non-smoking compartments are provided for those who prefer them and their rights should be preserved. They should be protected from the undesirable alternatives of suffering in silence the discomfort caused by an out-of-bounds smoker or of raising objections to his behaviour.

Railwaymen are instructed to see that these By-laws are observed. You are requested to co-operate, by precept and example, and so assist in keeping railway premises safe and pleasant for everyone.

S. R. NICHOLAS,
Secretary for Railways.

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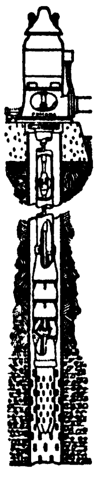

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THE LEUCOSIS DISEASE COMPLEX OF POULTRY

(*Concluded from page 220.*)

D. G. CHRISTIE, B.V.Sc., H.D.A., Veterinary Officer.

LEUCOSIS is an infectious disease caused by a virus—which is smaller than any bacteria and cannot be seen under the ordinary microscope. This causal agent must be present before the disease can occur, and any other predisposing causes, however important, will only tend to modify the manifestation and severity of the disease.

In April issue the author discussed the cause, symptoms, diagnosis, post-mortem appearances and course of the disease. In this concluding section he deals with claimed cures, and with methods of prevention and control.

Treatment.

No satisfactory cure has yet been discovered, and for the present it is recommended that all affected birds be destroyed. Brief mention is made of claimed cures.

Sulpha Drugs.—These have been claimed to cure some forms of leucosis, but it is thought that any success possibly achieved would be due to their effects on diseases operating concurrently with leucosis.

Potassium Iodide.—One English worker reported satisfactory cures in birds affected with fowl paralysis after injecting 5 c.c. of 10 per cent. solution of potassium iodide into the abdominal cavity on each of two successive days. There does not appear to be any confirmation on a field scale of this claim, and some workers are of the opinion that the treatment was in the nature of a tonic and in no way affected the disease.

Other Claimed Cures.—Brewer's yeast was fed at the rate of 2 per cent. in dry mash, together with 0.002 per cent. of a mineral mixture containing manganese sulphate, cobalt sulphate and ferrous sulphate. It was claimed that no cases occurred on one breeding farm so treated, whereas a very high incidence had been noted previously. In the light of our knowledge of the infectious nature of the disease, it is suggested that this "cure" probably corrected dietary deficiencies in this flock, and had no direct bearing on leucosis.

Future Fields in Treatment.

The discovery that the nitrogen mustards group of war gases has a selective action on certain blood cells, may offer in the distant future some hope of a satisfactory cure. The effect of this drug is to cause a depression in the number of white blood cells formed, while interfering little with the red blood cells. Experiments demonstrated that the drugs, when injected into birds affected with leucosis, acted on the immature blood cells and also apparently on the virus, because blood from treated birds was not successful in transmitting the disease when injected into healthy birds.

Radio-active compounds and particularly radio phosphorus are used in human medicine and have effects similar to those caused by the nitrogen mustards. Whether there will be an application of this line of treatment to the field of poultry in the future is uncertain.

Prevention and Control.

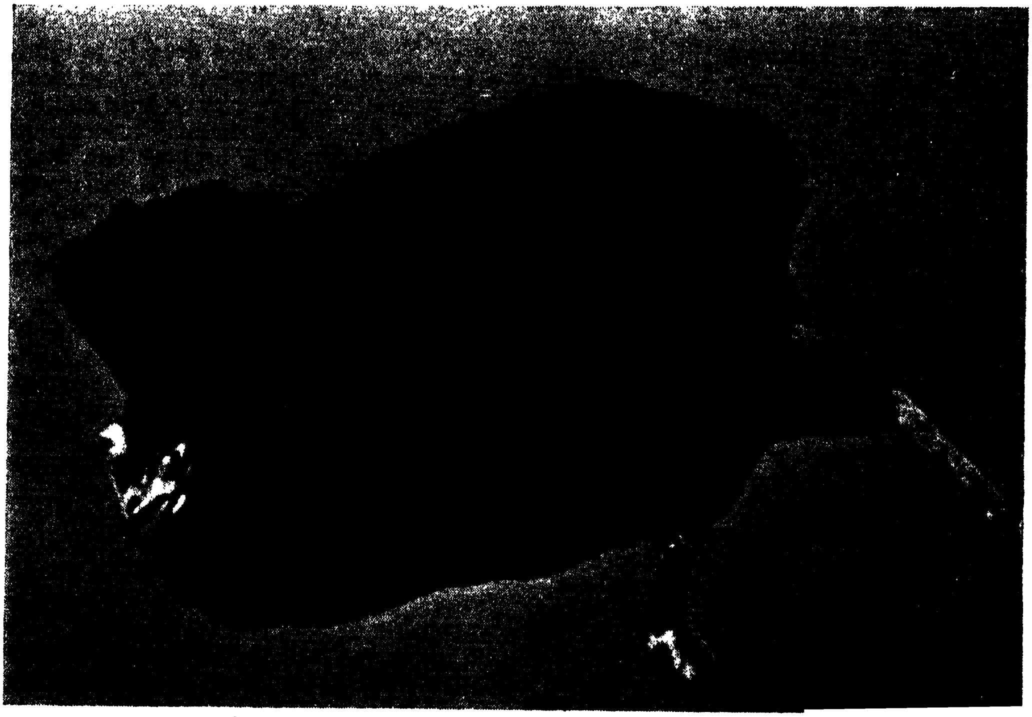
In the absence of an effective cure and because of the presence of big gaps in our knowledge of the disease, suggested lines of action can only be expected to *reduce* losses. These are based on information available, and particularly that relating to inherent resistance, susceptible ages and modes of transmission.

Breeding.—Resistance to the disease can be exploited by breeding only from birds of twelve months or older—both male and female. This would mean the use of first- and second-year, and even older hens with cock birds. These older birds are selected because they have demonstrated resistance to the disease. It is realised that the poultry industry's requirements for chickens could not be met if hens alone were used for breeding, because they do not come back on to lay after moulting, until well on in the hatching season.

In view of this, it is suggested that farmers use artificial lighting for the breeding hens to keep up the production over the autumn months and thus ensure that a greater percentage of eggs from the more resistant hens will go into the incubator. In this way some reduction of incidence in the next generation should be achieved. Artificial lighting is not harmful to hatching results nor to the development of the future chick, provided it is kept within reasonable limits. Further details on artificial lighting of houses for laying stock are available in a departmental leaflet on this subject, available from the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Producing Resistant Strains.—This field should be explored by the stud breeder who is, in any case, well advised to select the breeding pen carefully, discarding birds whose progeny have shown evidence of disease and retaining pen sisters whose offspring have remained healthy. Production and dissemination of resistant strains, which are also superior in egg-laying qualities and livability generally, would greatly assist commercial breeders.

Crossbreeding.—The Australorp-White Leghorn cross generally exhibits a higher resistance to leucosis than the Australorp, and in some cases higher also than the White Leghorn. In addition the increased vigour and livability of the cross earn it the prominent place it holds in the commercial poultry population.



Langshan Pullet (Alive) Affected with Fowl Paralysis Form of Leucosis.
Post-mortem examination also revealed lesions of the "big liver" disease form—see illustration on page 331.

Husbandry Aspects.—Ideally, chickens should be reared on virgin ground for the first six to eight weeks to prevent contact with infection during the most susceptible stage of their lives. Unfortunately labour difficulties and small holdings often militate against this line of action, and the alternative is to rear them intensively during the critical period.

As far as possible young stock should be effectively quarantined by distance and slope of land from adult birds. Quite

apart from the value of this policy in keeping down leucosis, it is important from the viewpoint of other diseases.

The ration should be carefully checked, and any deficiencies corrected. In addition, all other predisposing factors such as overcrowding, poor house ventilation, parasites, and other disease conditions, should receive urgent attention.

Culling.—Culling should commence in the brooder. Weak, undersized chickens are best destroyed. Birds showing even slight paralysis should be considered suspect. Older birds showing pearly eye together with a distorted, misshapen or paralysed pupil (which normally should be round), should be culled immediately and marketed for slaughter. These are cases of leucosis.

In breeding flocks where the disease assumes epidemic proportions, it is suggested that disposal of the entire flock for slaughter would be the wisest move. The farm should then be restocked with chickens secured from flocks known to have a low incidence of the disease.

View of the Organs of the Pullet Illustrated on Page 330.

The arrow indicates a light leucotic area on the much enlarged liver.

Pullorum Disease of Poultry.

Accredited Flock Scheme Commenced.

A SCHEME to reduce the heavy losses caused by pullorum disease by giving official recognition to poultry breeders and hatcherymen who keep their flocks free, or relatively so, from this disease has been formulated by the Department of Agriculture, following several conferences with the Breeders and Hatcherymen's Association.

"This scheme, to be known as the Accredited Pullorum-tested Flock Scheme, will prove a boon to individual poultrymen and to the industry," said the Minister for Agriculture (Hon. E. H. Graham, M.L.A.). "It is intended to bring the scheme into operation on 1st June."

"Pullorum disease, originally called bacillary white diarrhoea of chickens, causes heavy losses in recently hatched chicks. It is spread mainly through eggs laid by infected birds."

"This scheme is designed to attack the problem at its root by encouraging breeders and hatcherymen to test regularly, and immediately cull affected birds from their flocks," said the Minister. "In this way flocks can be kept relatively free of the disease. This will give protection to poultry-keepers buying replacements for their laying stock."

"A list will be published each month in the *Agricultural Gazette* showing owners in whose flocks regular pullorum testing has revealed very low incidence of the disease and from which infected birds are removed immediately they are revealed by the test."

"Other States, and even some overseas countries, have expressed interest in this project," said the Minister, "and it is likely that at a later date it will become mandatory for all eggs and day-old chicks exported from New South Wales to have originated from accredited flocks listed in the *Agricultural Gazette*."

The Division of Animal Industry of his Department would exercise supervision over the scheme, but testing would in the main be carried out by private veterinary practitioners, concluded Mr. Graham.

Breeders and hatcherymen interested in the scheme can obtain further particulars from the Chief of the Division of Animal Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

I WOULD like to take this opportunity to tell you that I found your *Gazette* very helpful during my ten years of farming. Please accept my thanks.

OUTSTANDING MILCH GOAT YIELDS
By Dam of "Northmoor Springbok"

IMPORTED BY N.S.W. DEPARTMENT OF AGRICULTURE

CONSIDERABLE interest attaches to the published reports of the recent performances of the British Toggenburg doe, "Northmoor Gazelle," the dam of §† Northmoor Springbok (BT1318), the British Toggenburg buck selected by the Stud Stock-buying Delegation for the Department's stud at Condobolin.

The following details are now available (British Goat Society Monthly Journal, January, 1949) of this wonderful milker.

Br. Ch. R5 Northmoor Gazelle* (B.T.R. 398) was born on 27th March, 1942. She kidded for the first time on 11th March, 1944, and has kidded regularly every year

Northmoor Gazelle.

since. She seldom seems to lose condition, and has given without exception more milk in a show than she has been giving at home, winning all the Quantity Milking trials in which she competed in 1947. She gave the highest show yield of the year (at Ripon) in 1947 with a yield of 22 lb. 2 ozs., and in 1948 at the Royal Show she broke the world's record for a 24-hour show yield with 23 lb. 13 ozs. Her awards include forty-one firsts, including sixteen milking awards. She has given over 8½ tons of milk to date.

TABLE OF RECORDS.

Kidded for first time 11th March, 1944, giving up to 1st October	2,702 lb. 4 ozs. in 200 days.
Kidding again next season on 28th May, 1945, and milking through from 1st October, 1944, to 1st October, 1945	3,482 lb. 4 ozs. in 361 days.
Kidding again on 8th March, 1946, she gave	3,474 lb. 14 ozs. in 328 days.
Kidding for fourth time on 15th February, 1947, she gave from 1st October to 1st October	4,685 lb. 14 ozs. in 299 days.
Kidding for the fifth time on 26th April, 1948, she gave from 1st October, 1947, to 26th September, 1948	4,154 lb. 13 ozs. in 314 days.
From 26th September, 1948, to 12th November, date of Recorder's last visit ..	496 lb. 14 ozs. in 42 days.

LACTATIONS.

Yield in Milk.		Butterfat Per cent.
1. 4,685 lb. 13 ozs.	439 days	3.1
2. 2,346 lb. 14 ozs.	247 days	4.3
3. 3,173 lb. 9 ozs.	278 days	3.6
4. 5,775 lb. 9 ozs.	389 days	3.2
5. 3,013 lb. 12 ozs. (part) ..	191 days	3.6

THE Food and Agriculture Organisation is an instrument which the adhering United Nations have created for their own use, to enable them co-operatively and thus more effectively than by working alone, to promote efficiency in the production and distribution of food. It may be termed a policy of enlightened self interest. By promoting the welfare of primary producers and by raising levels of nutrition, it is believed that higher standards of living may be more readily possible for peoples throughout the world.—R. J. NOBLE, Under Secretary and Director.

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MORE FARMERS USE DUNLOP LINKED-BAR TRACTOR TYRES THAN ANY OTHER MAKE!

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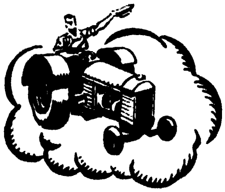
Dunlop full-width Linked-Bars — grip better!

Up to 12 feet more bar area — pulls better!



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Recommended treatment is clean first, then sterilize.

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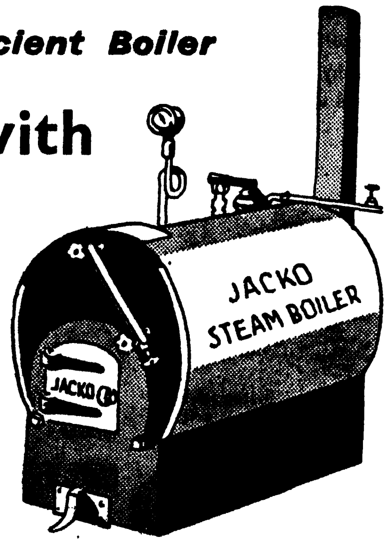

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Tubercle-free Herds.

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm	46	29/6/49
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys)	37	15/5/49
Cattell, E. J., "Kapunda," Rob Roy, Inverell (Jerseys)	112	14/7/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	26	1/6/49
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ...	62	21/6/49
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50
Police Boys' Club, Kurrajong	12	5/7/49
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys) ...	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Riverina Welfare Farm, Yanco	55	6/12/49
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	21/7/49
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	34	8/4/49
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	160	2/6/49
Wollongbar Experiment Farm (Guernseys) ...	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	67	26/4/49
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Baker, S. P., Myrtle Grove, Menangle ...	51	20/4/49
Barnardo Farm School, Mowbray Park ...	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	14	14/5/49
Daley, A. J., Lealands, Inverell	19	14/5/49
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell ...	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	27/4/49
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/49
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	7	25/6/49
Grant, W. S., "Monkittee," Braidwood ...	24	10/5/49
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	60	13/6/49
Hart, K. H., Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale ...	16	22/2/50
Jemalong Station, Forbes	45	4/6/49
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	17/6/49
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	33	2/7/49
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale ...	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood ...	31	13/8/49
McLane, R. G. P., Ibis Valley, Swanbrook ...	17	26/6/49
McMillan, N., Duval Road, Armidale ...	32	8/10/49
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows," Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
Rolfe, C. D., "Rose Farm," Inverell ...	31	17/3/50
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	8	12/7/49
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Michael's Orphanage, Baulkham Hills ...	29	11/6/49
St. Patrick's Orphanage, Armidale	12	8/10/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.	Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*			Waddell, W., "Afton," Oakwood Rd., Inverell ...	127	5/7/49
St. Vincent's Boys' Home, Westmead ...	30	9/7/49	Waters, A., Marsh Street, Armidale ...	2	8/10/49
State Penitentiary, Long Bay ...	14	27/11/49	Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Stephenson, W. J., "Hill View," Fig Tree ...	60	1/4/50	Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook ...	94	27/10/49
Tanner, F. C. Dural Rd., Armidale ...	42	8/10/49	Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook ...	141	18/11/50
Tombs, E. S., Box 76 P.O., Armidale ...	36	8/10/49	Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook ...	48	27/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49	William Thompson Masonic School, Baulkham Hills ...	55	27/4/49
Tombs, R., Harlwood, Armidale ...	37	8/10/49	Williams, L. B., "Birida," Armidale ...	37	22/2/50
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49	Youth Welfare Association of Australia, "Hopewood," Bowral ...	171	14/4/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook ...	94	14/3/51			
Ursuline Convent, Armidale ...	5	25/2/50			
Von Frankenberg, F. E., "Spring Hills," Camden ...	61	7/12/49			

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

The Control of the Queensland Fruit Fly—*continued from page 308.*

from 1 mm. to 1 cm. beneath the skin), or (*c*), similar flesh from a DDT cover-sprayed pear.

Within forty-eight hours all nine of the E605 flesh-fed flies were dead and eight of nine E605 skin-fed flies, whereas all DDT flesh-fed flies were alive for at least 120 hours, when observations were discontinued.

A further trial of this type, using the same lot of pears after refrigeration, was set up on 16th May. From this it was concluded that after twelve weeks the internal activity of E605 had diminished to less than that of the external deposit and that there was no measurable internal activity at this time.

Lice Infestation in Sheep—*continued from page 320.*

References.

[1] GRAHAM, N. P. H., Institute of Inspectors of Stock, of N.S.W. Year Book, 1947; pp. 102-105.

[2] MONNIG, H. O., Veterinary Helminthology and Entomology (1934); p. 333.

[3] HENRY, MAX, *Agr. Gaz.*, N.S.W., 51, No 9; p. 497.

[4] HENRY, MAX, Studies of Life History of *B. ovis*—20th Annual Report of C.S.I.R.—30th June, 1946.

[5] HENRY, MAX, Studies of Life History of *B. ovis*—21st Annual Report of C.S.I.R.—30th June, 1947.

[6] SCOTT, MISS M. T., personal communication.

[7] GRAHAM, N. P. H., personal communication.

Photography by Mr. R. Eastoe, H.D.A., Livestock Officer (Sheep and Wool), Department of Agriculture.

Brucellosis-free Herds (Cattle).

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Bathurst Experiment Farm (Ayrshires)	46
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	62
Dixon, R. C., " Elwatan," Castle Hill (Jerseys)... ...	29
Evans, C. A., & Sons " Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ..	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., " Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., " Nundi," Tarcutta (Red Poll)... ..	53
MacPherson, I. F., " Bloomfield," Yass (Aberdeen-Angus)	39
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., " Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead" Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87
Reid, D. B., " Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., " Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	39
Rowntree, E. S., " Mourabee," Quirindi	75
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Farm, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm	54
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Callen Park Mental Hospital	50
Cullen-Ward, A. R., " Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, " Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., " Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	45
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, " Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief, Division of Animal Industry.

Precautions Against Pleuro-pneumonia in Cattle.

WITH the opening of the Queensland cattle season, precautions against pleuro-pneumonia must not be relaxed if further outbreaks as a result of contact with introduced cattle are to be avoided.

Throughout the State generally, a very satisfactory state of affairs exists with regard to pleuro-pneumonia. Only one property is under surveillance in New South Wales at present. As cattle are to be introduced to this property from Queensland, preventive inoculation has been carried out as a precautionary measure.—DIVISION OF ANIMAL INDUSTRY.

GOOD housing for pigs costs very much less to the farmer than bad—in the long run. Mr. W. L. Hindmarsh, Chief of the Agriculture Department's Division of Animal Industry, points out in support of this statement that a pig that is warm and comfortable in inclement weather demands less from his stores of energy for maintenance. If he is cold and wet much of the energy derived from his food is used in maintaining body temperature, and thus less is available for growth and fattening.

Pigs forced to live without adequate shelter are also more susceptible to infections and succumb more readily to pneumonia, pig paratyphoid, swine erysipelas and various joint affections. Faults commonly present in pig housing are:—

(1) Insufficient shelter and draughty housing.
(2) Damp flooring.
(3) Badly drained yards and pastures.
(4) Overheating through crowding in small sties, and subsequent chill.

Brucellosis-free Herd Scheme (Swine).

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Draper R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Riverina Welfare Farm, Yanco.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Wagga Agricultural College and Experiment Station.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Prevention of Parasitic Infestation in Stock.

GENERAL measures of good management go far to prevent infestation of stock with lice, mange, parasites, and other pests. Of such measures, states a departmental bulletin, the chief are as follows:—

(1) Pigsties, stables, cow-sheds, and calf-pens built of sound material which does not afford cover and lodgment for parasites.

(2) Maintenance of all such buildings in a thoroughly clean condition, and admission of ample light and sunshine.

(3) Regular and thorough grooming of horses and cows, and washing of pigs.

(4) Prevention of overcrowding, particularly of pigs and calves.

(5) Isolation of infected animals.

(6) Cleaning of grooming gear.

(7) Inspection of stock before purchase.

Where parasitic infestation has taken place, measures must be taken to deal with the parasite in the animal, but the wonderful effect of good food in safeguarding stock from the ill effects of parasitic attacks must never be forgotten—in very few cases can administration of drugs compete with good feeding.

OUT of 230 turkeys, mostly of from six to seven months old, over 100 deaths occurred recently within a period of ten days—reports the Inspector of Stock, Albury.

From the information furnished and the material received, it seems certain that this mortality was due to botulism. The turkeys had been permitted range, and had had access to mouldy oats, barley and hay in pig pens. After the birds were penned up no further cases developed.

THE AGRICULTURAL GAZETTE FOR JULY, 1949

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Editorial—

EDUCATIONAL VALUE
Of Field Competitions

COMPETITIONS organised for the purpose of bringing to contestants the advisory services of officers of the Department of Agriculture are a very useful means of extending the educational activities of these officers.

This was emphasised by Hon. E. H. Graham, Minister for Agriculture when presenting awards to the winners of this year's Merino Ewe Competition organised by the "Farmer and Settler" newspaper with the object of raising the annual wool yield per head in commercial Merino flocks.

"My Department," said Mr. Graham, "is grateful for the opportunity of serving the purposes of competitions of this nature." In this way, said the Minister, officers of the Department had been assisted to render a great service to the smaller flockowners who were becoming increasingly important with the inevitable advance of closer settlement.

Valuable opportunities for acquiring information are presented to producers by the visits and the advice of departmental officers during the judging of these competitions, and many enter to receive this specific benefit. That this aspect had an important bearing on the success of this year's competition was claimed by Mr. P. H. White when introducing the Minister to the gathering.

And if further evidence were required of the appreciation of the services which departmental officers are able to render in this way, it was given by Mr. Mahoney, Editor of the *Farmer and Settler,* who said, "Fortunately, the day has gone when the man on the land regarded officers of the Department as theorists. These men are now welcomed as friends who can be a real help in improving the standard of the flocks. It must be pleasing to the Minister to know that no one has the slightest inclination to tag the label of bureaucracy on to the officers of his Department."

An interesting feature of the competition was the excellent support given by branches of the Agricultural Bureau, of which Mr. Mahoney stated "several branches had every reason to be proud of their local contests."

HYBRID MAIZE

Registered Seed Scheme

GROWERS INVITED TO CO-OPERATE

APPLICATIONS are invited by the Department of Agriculture from seedgrowers who desire to participate in a scheme for the production of registered hybrid seed maize.

Parent seed for the production of hybrid seed maize is available in limited quantities from Grafton and New England (Glen Innes) Experiment Farms to maize growers in suitable districts for the production of commercial hybrid maize seed. Inbred seed or single-cross seed is available for sowing in a Registered Seed Scheme according to the following:—

(1) Application for registration is to be made in writing to the Department of Agriculture, Sydney, or to District Agronomists.

(2) Registration of the area for the production of registered hybrid maize seed will be granted only after inspection of the site by an officer of the Department of Agriculture and on a signed declaration by the grower that:

(*a*) The plot for the multiplication of inbred seed will be so located that it will be at least 220 yards from other maize which may be expected to be tasselling at the same time;

(*b*) The crossing plot for the production of hybrid seed shall be so located that it will be at least 220 yards from other maize which may be expected to be tasselling at the same time or provided that if any such other maize is sown within this distance from the crossing plot, a protective buffer area of the male parent shall be established of one additional male row for each eleven yards less than 220. At least two male rows must be sown as a buffer on either side of the crossing block.

(3) Only one specific commercial hybrid may be grown for seed production on a farm except on farms large enough to satisfy isolation requirements.

(4) The seed increase area and/or crossing plots shall be open to inspection by officers of the Department of Agriculture at any time considered necessary.

(5) The entire acreage of each commercial hybrid grown by and/or belonging to one applicant must be eligible and must be inspected.

(6) Off type plants shall be destroyed as required by the Department.

(7) Fields shall not be passed for registration if growth conditions such as heavy weed infestation, lodging, etc., do not permit satisfactory inspection.

(8) Crossing plots for the production of hybrid seed shall not contain less than one row of the male parent to four rows of the female parent.

(9) Registration will be refused if more than 1 per cent. of the number of plants of the female parent are found to be shedding pollen. De-tasselling of an area rejected for registration must be discontinued.

(10) The nomenclature of the registered hybrid maize seed shall be determined by the Department of Agriculture.

(11) Inspection of the hybrid seed ears will be made, and off types or otherwise undesirable ears will be rejected for seed.

(12) Registered hybrid maize seed labels containing a declaration to be signed by the seedgrower will be provided by the Department of Agriculture. These labels shall be signed by the grower, one being placed inside and the other affixed to the outside of each bag or parcel.

(13) The seed sold shall conform to the requirements of the New South Wales Agricultural Seeds Act, 1921, and shall be graded and dusted with approved seed maize treatment material.

(14) A registration fee of £1 per acre shall be paid, in advance, by the grower, to the Department of Agriculture to assist in defraying expenses incurred in connection with inspections, seed testing, provision of labels, etc.

(15) The seedgrower shall furnish to the Deparment of Agriculture at the end of each selling season, a complete return of the names and addresses of purchasers, date of sale and quantity of hybrid maize seed sold to each purchaser.

(16) In certain cases the Department may allow the use of the term "approved" to be applied to commercial hybrid seed maize which does not comply completely with the above conditions for registration. In such cases the Department may also require that the nomenclature of this hybrid seed shall not be identical with that of any registered hybrid.

Single crossparent seed will be provided to seedgrowers under this scheme at a cost of 2s. per lb.

The closing date for receipt of applications under this scheme is 1st September, 1949.

The Provision of

FODDER FOR STOCK

In the Orange and Bathurst Districts

R. C. MADSEN, H.D.A., District Agronomist.

CLIMATIC conditions on the Central Tablelands and Central Slopes vary considerably, but there is one factor common to both areas, namely, moderately severe winter (June-August) conditions. During this period pasture growth is slow and too frequently deficient in quantity and quality. The decline in quality of pasture feed commences in the autumn and extends through to the spring, during which period there is a protein deficiency and poor palatabiltiy of the pasture. This decline is reflected in a lower effective food intake and a lowered production, particularly of milk, whilst it is also a contributing cause of sheep losses, mainly through lowered disease resistance.

To keep their stock in sound, healthy condition farmers and graziers of this area should practice supplementary feeding during the severe winter months as well as during droughts or periods of temporary shortage. This will assist in eliminating the difference between summer and winter production of dairy stock. This task is accomplished easily in this district owing to the wide range of fodder crops available to supplement the many available pasture plants.

Factor Affecting Production.

The Slopes districts may experience drought or semi-drought conditions during the summer, whilst the Tableland areas are much less subject to adverse summer conditions.

Lush and bountiful feed at the beginning of summer is no guarantee that favourable conditions will continue through to the autumn, even on the Tablelands where the rainfall is more regular. Quick changes in the pastoral outlook can be brought about by hot, dry, or cold conditions, bush or grass fires, rabbits and grasshoppers.

When feed is profuse there is the temptation to buy and fatten more stock—which may lead to overstocking and serious depreciation of the land should there be an adverse trend in seasonal conditions.

The conserving of fodder in seasons of plenty will assist in producing maximum returns per head and per acre in the shortest possible time, and also considerably assist in maintaining stock numbers and production, thus stabilising income.

Stock adequately fed, resist diseases and are therefore more profitable.

By systematic farm planning in these areas it should be possible to ensure an ample supply of feed for every month of the year, and to produce all of this feed on the farm.

To do this, productive mixed pastures containing grasses and clovers must be the background of the roughage porgramme, and must be considered the most important crop on the farm. No artificial feed can compete in cheapness with pasture, but to rely on pasture alone, is to fail in obtaining the principal advantage. Pasture should be supplemented by the production of crops for grazing and conservation to ensure that both quantity and quality are maintained. The correct balance between roughage and protein is most important.

In order that maximum production (milk, mutton, pork, bacon, etc.) is obtained and continuity of production maintained throughout the year, fodder crops must be grown for use during the periods when the pastures are unable to meet the requirements.

It is imperative that a comprehensive cropping programme should be in operation on every farm. It is futile awaiting the arrival of adverse periods before taking action.

Soil Fertility Must Be Maintained.

Soil fertility is most important and concerns every farm and farmer. It has a direct influence upon production costs and farm income—lowered fertility invariably results in decreased crop and stock returns. Fertility may be reduced to such an extent that owners may be forced on to other properties or to change their vocation. Every effort must be made to restore lost fertility and maintain and/or increase it wherever practicable.

The most potent factors in reducing soil fertility are faulty farm management, overcropping, overstocking, soil erosion, rabbits and weeds. Maintaining and increasing soil fertility may be attained partially by the adoption of a properly designed rotation of crops and pastures. There should be a combination of grassland and crop farming.

Old Cultivation Areas.

These should be taken out of cultivation at the earliest opportunity and laid down for a period to improved pasture, consisting of any one or more of the recommended grasses and clovers. This period will depend chiefly upon the locality and the arable areas available for cropping until they in turn are sown to pasture and the renovated paddocks brought back into cultivation.

A Thin Lucerne Stand on the Central Slopes Responds to Renovation and Topdressing. No treatment on the right.

Pasture improvement will maintain and raise the fertility of worn-out or old cultivation land by providing a more or less permanent ground cover and the addition of organic matter to the soil, so reducing soil erosion. A vigorous, dense, well-managed pasture will provide almost complete control of most noxious and undesirable weeds.

Crop Rotation.

Various sound rotations may be adopted to fit in with farm size, cropping and stocking programmes. Every rotation should include a period under improved pasture which contains one or more leguminous plants.

The period during which a paddock should be under improved pasture will depend upon farm size, degree of fertility, the condition and extent of erosion and the cropping and stocking programme. Paddocks must be of convenient size in order to permit a satisfactory rotation to be adopted.

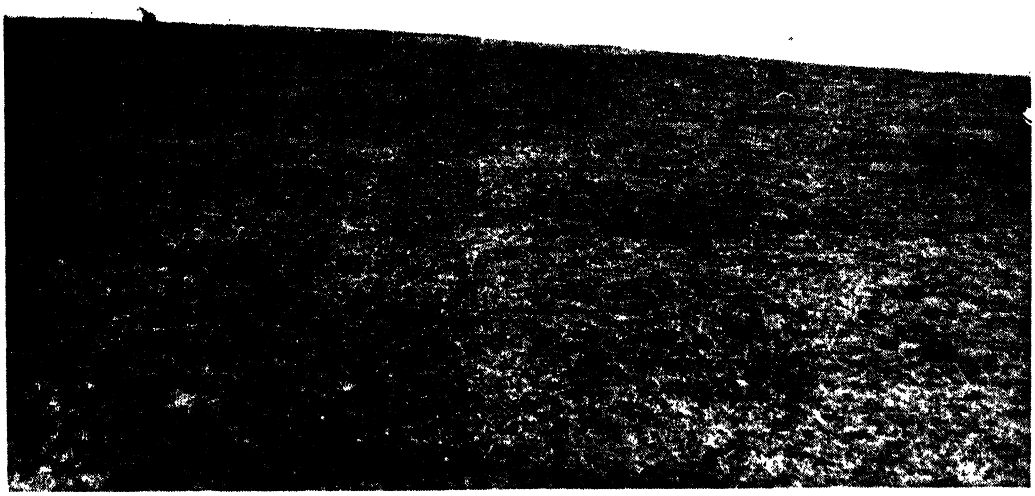
A rotation on the Central Slopes should include improved pasture; wheat for grain or hay; oats for grazing or grain; barley and Sudan grass.

A rotation on the Tablelands should include improved pasture, potatoes, peas, oats for grazing, hay or grain, wheat for hay and a limited amount of grain, swede turnips or rape, Japanese millet and maize in suitable localities only.

other valuable native grasses in pastures. The management of natural pastures should encourage their growth and seed production in order to thicken up the stand. This may be done by autumn topdressing with superphosphate at 84 to 112 lb. per acre, and renovating when compacted. This treatment tends to increase palatability and increases the supply of winter feed.

Topdressing may be carried out on practically every type of country by the use of one or other of the available methods. It may be unprofitable to plough if useful grasses, *e.g.*, Wallaby and Panic grasses, *Poa bulbosa,* Ball and Cluster clovers and trefoils are present.

To manage pastures effectively, the subdivision of paddocks and rotational grazing should be practised.



Old Cultivation Land, Overcleared and Overstocked and Susceptible to Erosion by Water.
Should be sown to improve pasture.

[*Soil Conservation Journal block.*

Utilisation of Pastures.

Natural Pasture.—These provide most of the grazing. One of the most valuable species, Wallaby grass, is well adapted to the climatic conditions and is relatively drought-resistant, palatable and nutritious. Everything possible should be done to maintain or even increase the usefulness of this and

Improved Pastures.—Every farmer and grazier should endeavour to have a balanced pasture of grasses and clovers, giving all-the-year-round grazing. Young, rich pasture of mixed grasses and clovers is the ideal and cheapest feed. Little, if any, supplement is required with this feed owing to its high protein and low fibre content. Such

pasture has a stimulating effect on milk production. It is inadvisable and undesirable to have too much of the one type of feed in a paddock. This will not provide stock with the balance necessary for them to obtain the nutrients for maintenance and production.

Valuable grasses such as Wallaby and *Poa bulbosa* readily respond to any increase in fertility resulting from a paddock being sown to improved pasture, including clovers. Their ability to compete with clovers increases as fertility rises, so providing the desired mixed pasture.

Where Subterranean clover predominates it is essential to have dry matter available when the pasture is young, succulent and lacking in bulk. Cereal or meadow hay is ideal for this purpose. Where lucerne predominates, the provision of dry matter in the form of hay or chaff is essential.

Productivity of the poorer class country is greatly enhanced when brought under improved pasture. All improved pastures should be topdressed with superphosphate at the rate of 84 to 112 lb. per acre in autumn. For the first few years after establishment they should receive liberal supplies in order to encourage a rapid and successful establishment of a complete pasture sward. Later it may be possible to relax but not terminate the programme of topdressing with superphosphate.

Renovation of Pastures.

The periodical renovation of improved and natural pastures is necessary to break up any compaction, improve aeration, and encourage growth generally. The frequency and severity of renovation will depend upon the type of pasture, soil and rate of stocking. Heavily grazed pastures should be more frequently renovated.

Subterranean clover and Wimmera Rye should be renovated every two or three years in March or April; lucerne in July or August; and *Phalaris tuberosa* every five or six years in June or July with a large mouldboard plough followed by harrowing.

Stock should not be grazed on a paddock indefinitely but grazed rotationally.

Sucker Lambs Ready for Market on Improved Pasture on the Central Slopes.
[*Rural Bank photo.*

Methods of Sowing Pastures.

(*a*) Subterranean clover (mid-season strain) may be broadcast with superphosphate in autumn on pastures in the higher rainfall areas only. Perennial rye and Wimmera rye may be distributed in this manner also, but it may not prove successful unless soil and climatic conditions are favourable. This is a wasteful method and extremely risky. All three species may, however, be scattered around fallen timber and dug-out rabbit burrows. This method is usually adopted where it is not possible to renovate the pasture.

(*b*) Where possible on non-arable areas, pasture should be renovated and superphosphate and seed applied at the same time.

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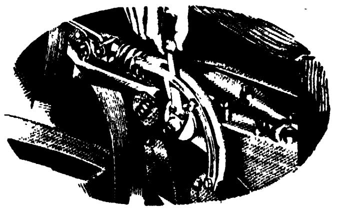

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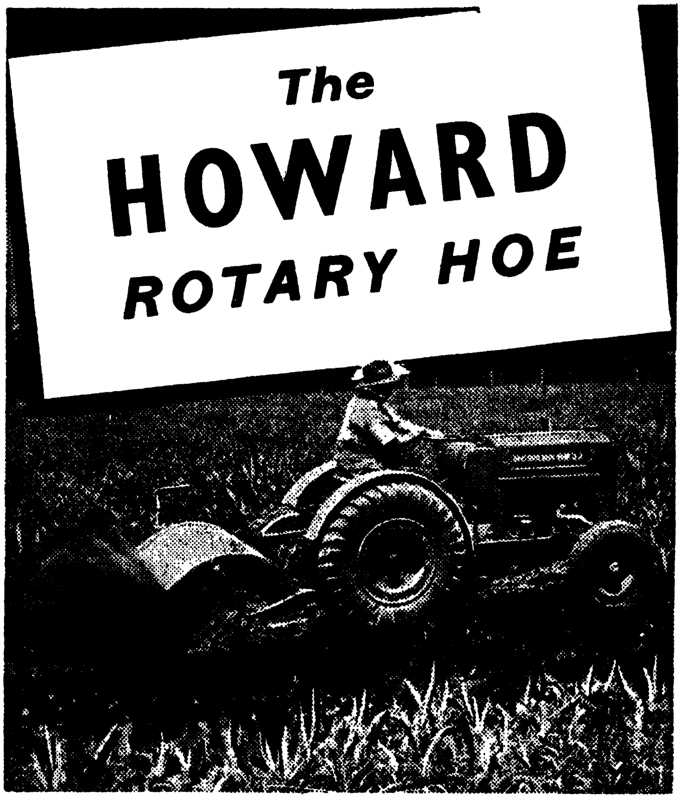

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This renovation will stimulate growth of annual grasses and provide more favourable conditions for germination of the pasture seeds.

(*c*) On arable and semi-arable areas, it is advisable to sow 25 lb. of Fulghum oats when renovating to build up the sward and provide a better balance. This will enable such pasture to carry stock better through the winter months. The oats should not be cut for hay or stripped for grain but be allowed to shatter.

Time of Sowing Pastures.—Pastures should be sown in the autumn. Spring sowings of lucerne may be made on areas that have been thoroughly prepared, but even under these circumstances there is the risk of partial or complete failure.

On the Central Slopes, mid-April to May sowings should be made. On the Tablelands, March-April sowings are desirable. Sowings must be completed well before the severe frosts.

Cover Crops.—The use of cover crops is in order, provided the rate of seeding of the cover crop is reduced by about half and the crop stripped and not cut for hay. The stubble provides a mulch through the summer as well as protection for the young pasture seedlings.

Pasture Mixtures.—These will depend upon soil and climatic conditions, but all mixtures should include at least one legume. Legumes, in addition to providing the protein, also enrich the soil with nitrogen and organic matter and so stimulate the growth of the grasses.

On the Tablelands, Subterranean clover (mid-season strain) is the basis of all pasture improvement work, whilst on the Central Slopes lucerne is the basic plant.

Pasture may be either (*a*) temporary or (*b*) permanent. Correct use must be made of the pasture plants for the different localities in order to prevent disappointing failures.

Pasture Improvement and Disease Prevention.

Pasture improvement and crop grazing are often associated with disease conditions such as hoven in cattle, entero toxaemia in sheep and mineral imbalance in cattle and sheep, but these conditions are readily preventable under proper management. Supplementary feeding with cereal or meadow hay or chaff, combined with other suitable measures, will greatly reduce losses from the two former conditions; and rotational grazing, which provides a balanced diet, will largely overcome mineral imbalance as a result of grazing on cereal crops.

The higher rate of stocking with improved pastures will tend to increase infestation with internal parasites, but proper management will overcome this risk.

(*To be continued.*)

Rotary Hoe Tillage.

To Prepare Stubble Land for Tine Implements.

BY ceasing to burn stubbles an attempt is being made by wheatgrowers to give back in some measure the materials taken from the soil by cropping, and to restore the fertility which has been depleted over the years. In doing this, however, another problem arises—that of reducing the stubble back to soil so that it may be worked by tined implements.

Where sheep are grazed and long fallow is practised this is a minor difficulty. To the farmer who wishes to sow on the stubble either for feed or grain the problem becomes serious, since, at present, he has no implements with which to make a satisfactory job of incorporating the stubble in the soil.

Attempts are now being made to devise special implements for this purpose—some of which are being tested at present under practical conditions at departmental experiment farms.

At a recent demonstration at Temora Experiment Farm, a rotary hoe gave a performance of dealing with stubble which was eye-opening in its efficiency. The ground was thoroughly tilled and the straw was chopped up into short lengths so that both a springtooth and a drill were put through the soil without difficulty. Furthermore, there was such a dispersion of the straw throughout the soil as to give ideal conditions for a rapid resolution of this and other organic matter into humus.

The machine has some disadvantages which would need to be overcome. Its tendency to pulverise the soil could perhaps be rectified either by more slowly revolving rotors or by a more rapid forward motion of the machine when at work. The width of cut is a further drawback—the demonstration machine gave a 4 feet 6 inch cut, and this could not compare with the 7 feet to 8 feet land ploughed by a 14-disc implement.

Another implement, undergoing trials at Temora Experiment Farm, is designed to rake the straw from between the tines of the combine to prevent choking as it progresses, and to leave the straw in the form of a loose covering on the surface of the cultivated and/or sown soil.

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36A, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albury Sheep Show (A. G. Young) .... July 19, 20, 21
Condobolin .... August 9, 10
Trundle .... August 16, 17
Weethalle (P. G. Ussher) .... August 17
Bedgerabong .... August 20
Wagga Wagga (G. O. Dewey) . August 23, 24, 25
Wentworth (S. Clifford) .... August 24
Peak Hill .... August 26, 27
Parkes .... August 29, 30, 31
Grenfell .... September 2, 3
Young (T. A. Tester) .... September 6, 7
Forbes .... September 9, 10
Cowra .... September 13, 14
The Rock (O. L. Boyd and A. F. Walker) .... September 17
Canowindra .... September 20, 21
Eugowra .... September 27, 28
Leeton (E. C. Tweedie)..September 30, October 1
Albury (A. G. Young) .... October 11, 12, 13
Kyogle .... October 12, 13
Lismore (North Coast National) October 19, 20, 21, 22
Alstonville .... October 27, 28
Murwillumbah .... November 2, 3
Mullumbimby .... November 9, 10
Bangalow .... November 16, 17
Nimbin .... November 24, 25

1950.

Paterson (S. M. Reynolds) .. February 9, 10, 11
Newcastle (P. G. Legoe) February 22, 23, 24, 28
Dorrigo (H. S. Doust) .... February 24, 25
Gundagai (J. C. Sattler) .... March 7, 8
Dungog (M. Riordan) .... March 24, 25

Approved Vegetable Seed, July, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear that number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36A, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Pearson (Moscow) (H.R. 47/6 and H.R. 48/1)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 47/2)—H. P. Richards, "Sovereignton," Tenterfield.

THE *Agricultural Gazette* is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.

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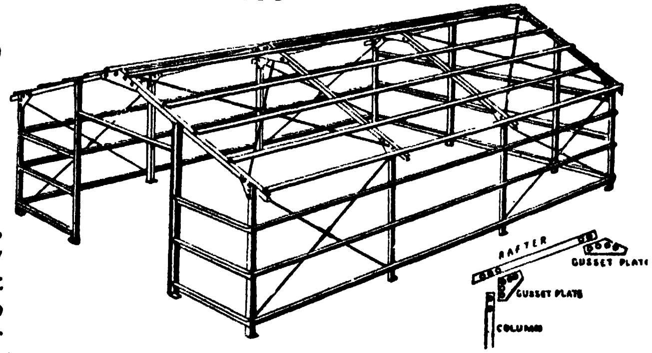

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Crystal Apple	2/-	6/6	19/6	—
Richmond Green Apple	2/6	7/6	21/6	21/-
Boston Pickling	1/10	5/6	16/6	16/-
Black Diamond ("Staygreen")	1/6	5/-	15/-	14/6
LETTUCE—				
Great Lakes (Outstanding for Summer)	4/-	13/6	45/-	44/6
MARROW and SQUASH—				
Long White Bush Marrow	1/2	3/6	11/-	10/6
Early White Bush Scalloped Squash	1/6	4/8	14/10	14/6
PUMPKIN—				
Queensland Blue	1/4	3/9	11/6	11/-
ROCKMELON—				
Hales Best P.M.R. 45	1/6	5/-	15/-	14/6
Pride of Wisconsin (Recent variety)	1/8	5/4	16/-	15/6
WATERMELON—				
Hawkesbury Wilt Resisting	1/6	4/9	14/6	14/-
Early Sugar (For early market)	1/8	5/10	18/6	18/-

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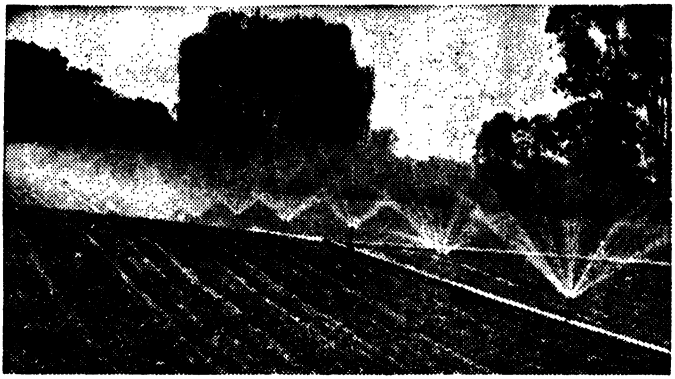

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TO IMPROVE YIELD, QUALITY AND DISEASE RESISTANCE

CONTRIBUTED BY DIVISION OF PLANT INDUSTRY

ALTHOUGH much yet remains to be done in potato improvement in this State, particularly in relation to disease and drought resistance, the work carried out by this Department at New England Experiment Farm, Glen Innes, since 1929 has yielded very valuable results.

The object of this work is the production of new varieties with wide adaptability, high yield, improved quality, and resistance to disease and pests. It has been attempted by selection, by introduction and by crossbreeding. By these means better strains of existing varieties have been produced, suitable introduced varieties have been brought into commercial use and better new varieties have been released.

The varieties Moona, Monak and Adina, the first to be produced and released (in 1948) by the Department have, under test, proved their superiority to the standard variety Factor in yield of marketable tubers.

Recent and projected work is designed to improve further the agronomic qualities, and to develop resistance to virus and fungous diseases and to drought.

Early Improvement by Selection.

The improvement work was begun in 1929 with the selection and release of desirable strains from the variety Factor and the commencement of a breeding programme, having as its objective higher yields and better quality. Progress was impeded at first by the unavailability of pollen-producing parents but this problem was solved in 1932 by the introduction, from America, of Katahdin and the selection by a local farmer of a seedling from Brownwell's Beauty—which he named Scott's Seedling. These two pollen parents formed the basis of the programme.

Wide Search Yields Useful Introductions.

It was soon obvious that a wider range of parental material was needed if the objects of the breeding programme were to be achieved. Consequently a wide-searching introduction programme was started, and in

Potato Seedling Plot at the Sub-station.
The seedlings shown are in their second year of trial.

less than a decade, seven hundred varieties were introduced from all over the world. Introductions made included named varieties which were tested for their direct commercial use as well as for their breeding value, and some wild South American species of no commercial value but with high qualities as potential breeding material.

Late Blight Seedling Tests in the Glasshouse at New England Experiment Farm.

A wild species, *Solanum demissum*, shows immunity while commercial varieties have completely succumbed.

As a direct result of this introduction scheme, Katahdin, Sebago and Sequoia have become established commercial varieties in New South Wales.

Importance of Disease Resistance.

By 1939-40 virus diseases had become one of the greatest limiting factors in profitable potato production, and breeding for resistance to these diseases was recognised as the most important feature of the improvement programme. Selection for moderate field resistance to late and early blights was also given priority. To meet this modified programme crosses were made during the season, using Katahdin, S41956, *Solanum rybinii* (virus resistant) and Sebago (blight-resistant) as parents.

To facilitate the testing of the seedlings raised as a result of these crosses a glass-house was built on the farm and a small area of land was obtained at the Trout Hatchery at Guyra for raising seedlings. In 1941-42, 5,000 seedlings were planted out in this plot and preliminary selection of them carried out at the end of the season.

During the next two seasons the war interrupted the programme and no further crosses were made. However the material was maintained and rigidly selected. In 1942-43, of the 1,141 lines planted, only 283 were retained for planting the following season. This figure was reduced to 112 during 1943-44.

In 1944-45 intensive yield testing of these lines was begun at Guyra. The seedlings were also tested for their reaction to virus diseases, late and early blights, common scab and brown fleck and to a severe infestation of the potato moth. Resistance to heat and drought was measured. Foliage characters, shape, size and uniformity of the tubers, percentage of marketable tubers and keeping quality were also observed. Any seedling showing a major fault was rejected, whatever its good features. As as result only twenty seedlings were retained, of which four showed great promise.

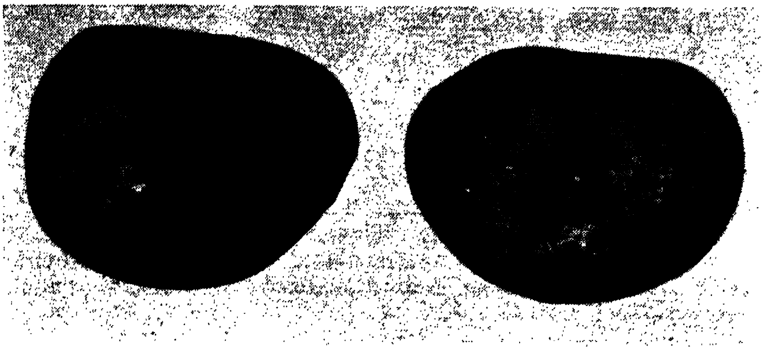
New Varieties Named and Released.

During the next three seasons the seedlings were tested in extensive field trials in the main potato regions of the State, to determine their adaptability and their value in comparison with the standard main crop variety Factor. Three seedlings, S.2510 (Pontiac x Katahdin), S.2511 (Pontiac x Katahdin) and S.2520 (Factor x 336-144 —now named Saranac), proved superior to Factor in yields of marketable tubers, even under poor growing conditions. In 1948

Berry Formation on a Potato Seedling at New England Experiment Farm.

it was decided to name these seedlings and release them to commercial growers. The names chosen were Monak, Adina and Moona, which are aboriginal words meaning, respectively, sunshine, good and plenty.

The dark-green top growth is exceptionally vigorous and sturdy. Tubers are medium to large, oval to round in shape, with shallow eyes and a finely netted skin at maturity; tubers are set compactly. In normal seasons the variety is reasonably free from second growth and hollow heart; keeping quality of the tubers is medium to good.



Tubers of the Variety Monak.
This variety which has consistent high yielding ability, was bred by the Department at New England Experiment Farm, Glen Innes.

Thus, another chapter was added to the history of plant breeding in New South Wales, these three potato varieties being the first to be bred and released by the Department.

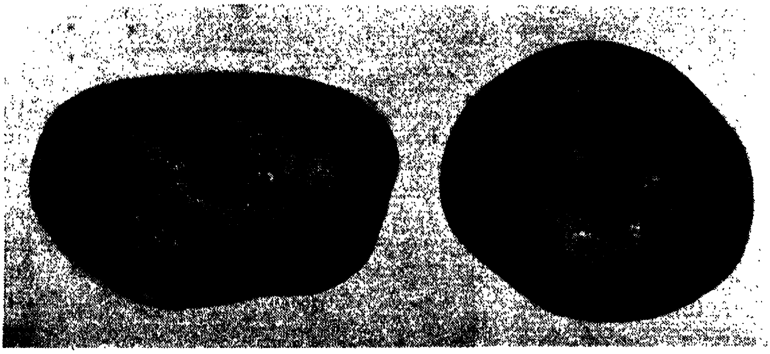
The Varieties Described.

A description of the varieties follows:—

Monak (S.2510).—The outstanding feature of this variety is its consistently high yielding ability. In yield trials over the last four years it has given yield increases of 23 per cent. over Factor. Trials have shown that the variety is well adapted to a wide range of soil and climatic conditions. It matures later than Factor in most potato districts.

Monak has greater field resistance to late blight than any other commercial variety grown in New South Wales. It has a reasonable degree of field resistance to virus diseases and some field resistance to common scab. A trace of brown fleck has occurred in Monak, but to a no greater extent than occurs in Katahdin under similar conditions.

Moona (S.2520).—This variety is a high yielder. In yield trials over four years it has out-yielded Factor by 33 per cent. In addition it produces a high percentage of No. 1 grade tubers. It has midseason maturity, similar to Factor, under New England conditions. It is well adapted to a wide range of soils and climates.



Moona Potato—Also Bred and Released by the Department.
This variety is a heavy yielder with a high proportion of No. 1 Grade tubers. Suitable for a wide range of conditions.

Top-growth is strong and vigorous. Tubers are attractive, being white, medium to large and oval, with a smooth to finely-netted skin, and comparatively few shallow eyes. Sprout growth is vigorous. Culinary and keeping qualities are good.

Field observations indicate that Moona is more resistant to virus diseases than most commercial varieties. It has some field resistance to late and early blights and brown fleck, and to a less extent to common scab. It escapes moth attack far more than Factor. Under unfavourable conditions Moona may develop bad growth cracking, though to a less degree than Factor. This can usually be avoided on the tablelands by delaying planting. Moona is as drought-resistant as Factor.

During 1947-48 a number of crosses was made with the object of improving agronomic quality and developing resistance to virus and fungous diseases and drought. Katahdin was used as the pollen parent and was crossed with:—

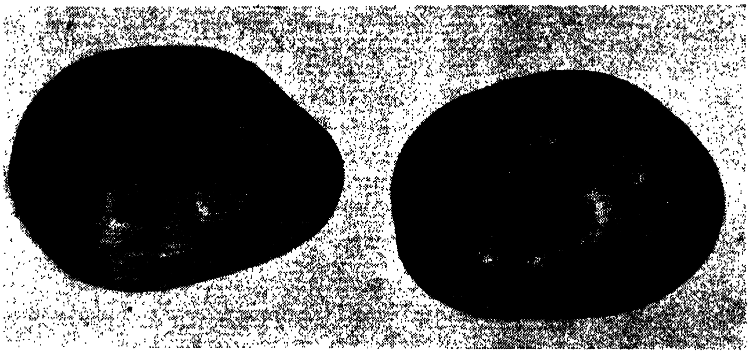
Monak, Moona and Sebago—for virus and late blight resistance.

Factor, Sequoia, Snowflake and S.2517—for virus resistance, high yield and cooking quality.

Seneca and Cayuga—for scab resistance.

S.2506—for early maturity and yield.

During the season 1,000 second-year seedlings were planted at the substation. These were inspected regularly and 600 of them were rejected owing to virus infection or undesirable agronomic features. Further selection of the remaining 400, based on internal tuber characteristics, is in progress. Four thousand new seedlings were raised and 800 retained for testing and selection.



Adina Potato Tubers.

Yet another variety bred by the Department at New England Experiment Farm. Adapted to the medium and low fertility soils of the tablelands.

Adina (S.2511).—This variety is adapted to the medium and low fertility soils of the tablelands where good yields are produced. It has a limited use on the coast. Adina is a late maturer.

Foliage is dark-green and moderately vigorous. Tubers are medium to large, oval to round and white skinned with comparatively few shallow eyes. Tubers, which are set compactly, have very good cooking quality.

Adina has good field resistance to late and early blights and brown fleck. It is relatively free from second growth.

Further Work on Disease Resistance.

In 1946 an additional area of 22 acres was leased by the Department to establish a substation, which provides further facilities for raising seedlings.

And What of the Future?

It is fully recognised that, in spite of the work already done, diseases are still a major problem in the industry. Leaf-roll is the most serious virus disease, and late and early blights frequently cause serious losses, the latter resulting in considerable yield reduction in the tablelands in most seasons. Another disease, common scab, often extensively damages crops in the central tablelands.

Projected breeding programmes are, therefore, closely concerned with procuring resistance to these serious diseases. The position has been strengthened by the selection of several varieties observed to have

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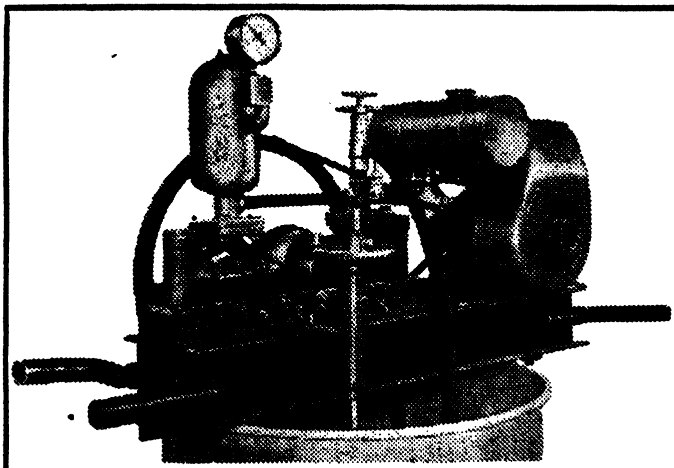

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disease-resistant qualities under local conditions. American introductions, Empire, CRH-3, Kennebec and Ontario and the Scotch variety Venus have shown resistance to late blight. Cayuga, Seneca, Ontario and Russet Burbank from America showed high resistance to raised scab, and another American introduction, Menominee, resistance to scab and early blight. These varieties will be used as parents.

Co-operation with C.S.I.R.O.

A co-operative project for breeding disease-resistant varieties is being carried out this season by the C.S.I.R.O. and the Department. Under the Memorandum of Agreement the C.S.I.R.O. provides parental material, suggests crosses and tests the progeny for virus infection. The Department carries out the actual breeding and seed increase, the spotted wilt and scab resistance trials and the culinary quality tests.

Training Students in Practical Citizenship At Wagga and Hawkesbury Agricultural Colleges.

STUDENTS at Wagga Agricultural College recently completed a week's study of practical citizenship and leadership qualities under the guidance and criticism of specialist officers of the Division of Information and Extension Services of the New South Wales Department of Agriculture.

Commenting on this innovation, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said: "This training will not only greatly benefit those students who return to farm localities in due course, where they will be able to take an important place in district public life and in healthy local group activities, but will also be of great potential value as training in some of the arts of agricultural extension methods for those students who may, on graduation, join the field staff of the Department of Agriculture and allied departments," added Mr. Graham.

The students studied various phases of public speaking, serious and social, debating, discussion group procedure, chairmanship, honorary secretaryship, meeting procedure and constitutionalism, play readings and other forms of group activity.

"A feature of the week's study was the extent of practical individual participation in each of these activities by each student under the eyes and comments of experienced critics," said Mr. Graham. "Later, the College Principal and Staff will encourage the students to take every possible opportunity during the course of their corporate life at the College to practise the lessons of this intensive one week of specialised study."

Mr. Graham said Hawkesbury Agricultural College students in their final year were about to begin a similar course in leadership, public relation and extension method training, the subject matters being spread over a series of individual lectures and demonstrations to occur at intervals throughout the next few months. The relative merits of these two different approaches would be closely watched.

These courses of study are typical of those which have for some time past been conducted at Rural Leadership Schools by officers of the Department in association with the Agricultural Bureau of New South Wales.

Doctor of Science in Agriculture Degree Awarded for Research on Black Spot of Citrus.

"THE University of Sydney recently conferred the degree of Doctor of Science in Agriculture on Mr. T. B. Kiely, Plant Pathologist of the Department of Agriculture in recognition of his researches on the fungus which causes the black spot disease of citrus."

Making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that Dr. Kiely had carried out investigations on this disease for some years in the Gosford district with headquarters at the Narara Viticultural Nursery. He had made several fundamental contributions to our knowledge of the disease and had made possible the development of control measures. With the adoption of these by growers, losses from black spot had greatly declined.

"The successful investigation carried out by Dr. Kiely provides another example of the value of the application of science to agricultural problems, and is another instance of the outstanding work being performed in the interests of agriculture by highly-skilled officers of the New South Wales Department of Agriculture," added Mr. Graham. "I am proud of Dr. Kiely's achievement and, at the same time, I wish to record my appreciation of the valuable financial assistance given by the Gosford Citrus and Agricultural Association to the investigation during its early stages."

IMPORTATION OF NEW ZEALAND FRIESIAN HEIFERS

By Department of Agriculture

THE Minister for Agriculture, Hon. E. H. Graham, M.L.A., announces that seven outstanding Friesian heifers have been imported from New Zealand for the Department of Agriculture's Friesian Stud at Hawkesbury Agricultural College.

Mr. Graham said the heifers were purchased on behalf of his Department by the Chief, Division of Dairying (Mr. G. McGillivray), and the Special Dairy Officer (Mr. I. Scott), who recently visited New Zealand for the purpose of making a close study of the dairying industry in that country.

"These importations were authorised," said Mr. Graham, "as part of my all-out effort to encourage increased production by the promotion of improved practices, including the breeding of high production stock, so that the dairy industry in this State will be brought to the highest peak of efficiency."

Giving details of the purchases, Mr. Graham said: "The Friesian heifers are from the herds of Messrs. R. E. Gillman and Son, Rangiora, C. W. Hunn, Rangiora, R. H. Dickie and Son, Mataura, all of whose properties are located on the South Island, and Mr. R. G. McIntosh, whose stud is located at Paeroa on the North Island of New Zealand.

"The heifers are approximately two years of age and should calve within the next few months. They have been selected from among the top herds for type and production in New Zealand. All are backed by production figures, while several of the dams carry type classification ratings of VHC and HC.

"Lauderdale Bertha Burkeyje (VHC), the dam of one of the heifers, has a life-time production of 5,203 lb. of butter fat in ten records. Her best record, achieved at the age of 11 years and 8 months, was 16,417 lb. milk, 4.3 per cent. test, 710.9 lb. butter fat in 305 days. Her sire was the South Island champion bull for 1942, five of his daughters averaging 694 lb. of butter fat.

"Elmwood Maggie (VHC), the dam of one of the heifers, Pinevale F. Q. Lenora, has a record at 9 years of age of 11,321 lb. milk, 4.1 per cent. test and 465 lb. butter fat in 278 days, while her sire, Koromiko F. P. Quality, has been unbeaten in the show ring.

"Okains Royal Comet, one of the heifers purchased from Mr. McIntosh, has as her dam Okains Bonny Twinkle, which, at 4 years of age, produced 13,805 lb. milk and 478 lb. butter fat in 305 days.

"These importations will serve to infuse new blood into our dairy stock. At the same time, they will introduce a high test factor for which New Zealand breeders have been striving for many years."

Old Letter from William Farrer.

Discovered at Wagga Agricultural College.

A LETTER of historical interest, written by William Farrer in 1897, was discovered recently by Mr. F. Butler, Assistant Plant Pathologist of the Department, in the loft of the old weighbridge shed at Wagga Agricultural College.

Farrer wrote the letter in September, 1897, from "Lambrigg," his property near Queanbeyan, to N. A. Cobb, then the acting manager of Wagga Experiment Farm. The letter supplied Cobb with notes on the difference between durum and poulard wheats, and commented on Cobb's proposals to arrange for the milling of 100 bushels of each of a large number of standard varieties " . . . before a committee of millers, bakers and experts."

In the letter Farrer put forward the suggestion that the Department provide itself with a small mill and use a bushel only of each variety. His further comments on this matter reveal his practical and realistic outlook.

The location of Farrer's breeding work in the cool climate of "Lambrigg" must have restricted the testing of his wheats against rust, for in the letter he states: "I only wish, we could get a rusty season . . . ."

The letter is now held in the archives of the Farrer Memorial Trust.

FOR the first time now, we have in New South Wales five Dingo Destruction Boards covering all infested country in our Eastern and Central Divisions. The Department wishes to acknowledge the co-operation and assistance of Inspectors of Stock in establishment of these Boards and in the development of their activities. This is a splendid move forward in this State's campaign against the dingo. The Minister has secured additional financial assistance for the Boards, and it is hoped that the Boards will meet with every success.—R. J. NOBLE, Under Secretary and Director, when opening the Stock Inspectors' Conference.

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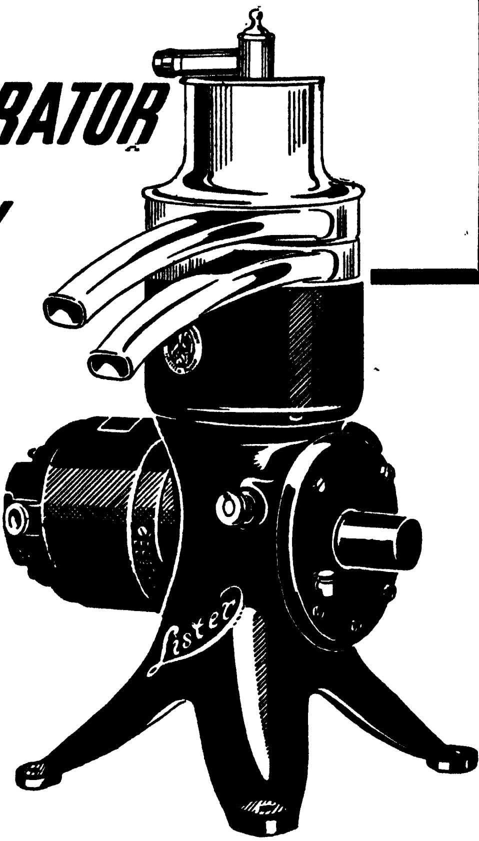

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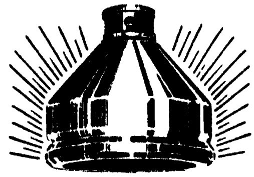

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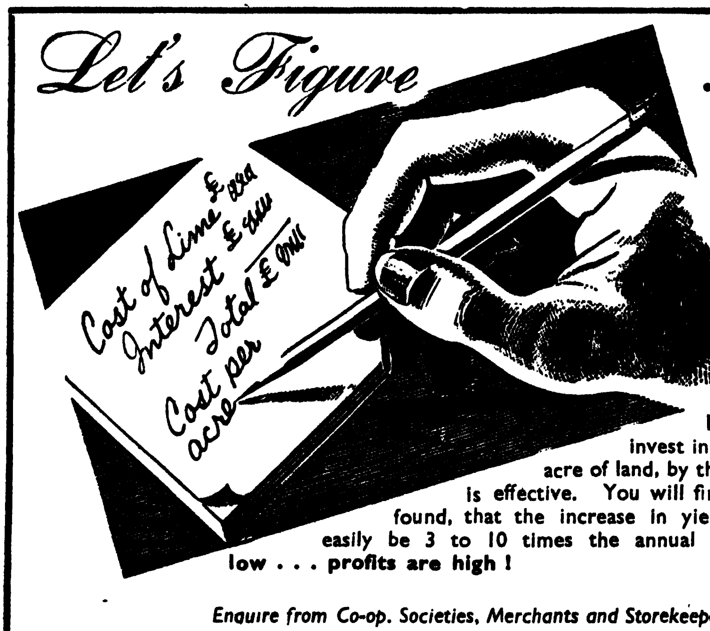

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

EXPORT CONTRACTS FOR FARM PRODUCE

IN the period prior to the great depression in the early 'thirties, most goods in international trade moved freely. Australia had then comparatively little anxiety regarding export markets for her surplus commodities and was able to share in an expanding world trade without the need for entering into trade agreements. Since then, however, the instability of the prices of agricultural produce in world markets has led to a marked tendency in most countries for the development of commodity control schemes and inter-governmental contracts. Australia has interested itself in such schemes and is, for example, now completing fresh agreements with the British Government to take the place of earlier contracts, one of which—the recently concluded meat agreement—is of long range type. Other countries are similarly interested in agreements to cover the marketing of exportable farm-produced surpluses, and here by way of illustration may be mentioned the proposed International Wheat Agreement and the recently completed trade agreement between the United Kingdom and Argentina.

Importance of Our Exports.

In the same way as the individual farmer wants stability and, if possible, a long-term secure market for his product, so governments seek the same advantages. Most would naturally like to guarantee prices to their farmers, and the higher the prices the better, but there are great difficulties where international commodity prices are so variable and there is uncertainty about the trading policies of competing countries. That is why governments concern themselves with making bilateral and multilateral trade agreements, which, as with all business dealings, large or small, mean the weighing of relative advantages, some give and take, and protracted negotiations beforehand.

World-wide currency difficulties as an aftermath of world war II and an almost universal "dollar shortage" are factors which are adding further complexities to a return to conditions of normal trading between nations and make for the continuance of restrictive policies, both as applied to internal and external matters of trade.

Most Australian primary industries are greatly dependent on world markets for the disposal of a substantial portion of their

output. The extent of this dependence upon oversea markets may be gauged from the fact that in the immediate pre-world war II years, the following percentages of total production were exported:—Wool, 91.7 per cent.; wheat, 65.1; butter, 49.2; cheese, 46.97; meat, 22.8; canned meats, 42.9; apples and pears, 39.7; canned fruits, 53.5; dried vine fruits, 78.1; wine, 21.2; sugar, 52.8 per cent.

Of all oversea markets, the United Kingdom market has been, in the past, of overwhelming importance to this country. Just prior to world war II it took upwards of 55 per cent. of Australia's total exports, more than 90 per cent. of its dairy produce and meat exports, and very high percentages of all other important food exports except wheat, the percentage of which varied somewhat, but was generally above 40 per cent. of the export. More than 40 per cent. of Australian wool exports in this same period also went to the United Kingdom. These figures give support to the statement that "the maintenance of British importing capacity is the most important factor influencing the prosperity of the agriculture of this country."

Results of Unstable Prices.

Experience has shown the unfortunate results which follow from the unstable movement of agricultural produce in world trade. Since world war I, for example, the world price of wheat and jute has been approximately halved three times within a period of about twelve months, and the price of cotton three times within eighteen months. Records of Australian wheat and wool prices reveal similar violent fluctuations. The average seasonal price of wheat, to illustrate, jumped from 5s. 1½d. per bushel in 1919 to 8s. 7¼d. one year later. Between 1921 and 1922, prices dropped from 8s. 8d. to 5s. 8d. The marked fall in wheat prices from 1926 was associated with a striking increase in world wheat stocks. On 18th August, 1926, world wheat stocks were about 550,000,000 bushels, compared with 1,200,000,000 in 1934.

The progressive improvement in wheat prices in the three years following 1934 was accompanied by a progressive decline in world stocks following poor seasons in North America. When world stocks again began to accumulate in 1938 and 1939, wheat prices again fell. In 1937 the price was 5s. 2d. per bushel, but by 1939 it had exactly halved.

It is here relevant to mention that because farm production costs are relatively fixed, any given fluctuation in prices means a much more violent fluctuation in farmers' incomes. A 20 per cent. commodity price fall, for example, might conceivably halve or even wipe out a farmer's or a national industry's profit for the year. "Interpreted in terms of human offering," writes one authority, "violent swings in world prices of agricultural products have meant that (on some occasions) farmers in many countries have been unable to purchase clothes or boots, or pay their debts, or obtain food other than that produced on the farm."

Australia is in a peculiarly vulnerable position with regard to overseas price fluctuations, as a large proportion of our national income depends on exports, *e.g.*, in 1947-48 pastoralists alone earned 27.5 per cent. of our national income, mainly, of course, from exports. Thus the level of export prices is a matter of vital concern to Australia, and a network of long term export contracts can serve as a useful buffer against fluctuations in the world economy. A system of "forward" prices is also beneficial in that it enables the individual farmer to plan ahead with a greater degree of certainty. It helps him to make such decisions as—"Will I concentrate on fat lamb production or wool growing?" or "Will I plant wheat or linseed?" If he can depend on a certain set of prices being fairly stable, he knows with reasonable certainty which line will be most profitable to him, and he can allocate his land, labour and capital accordingly.

Summary of Our Export Contracts.

During world war II, contracts were arranged with the United Kingdom and the Services for virtually all the available surplus of many of Australia's primary products. Generally speaking, these arrangements, which gave producers a welcome measure of security, were scheduled to last no longer than 1948 for most products.

However, several important contracts have been revived or extended for a further period.

Australia has at the present time contracts, mainly with Great Britain, for the export of butter and cheese, meat, eggs, wheat and dried fruits. A rough estimate of the probable value of each of these contracts in Australian currency for the 1948-49 season will indicate what proportion of our exports has a guaranteed market.

Under the contract for dairy produce with Great Britain, we should receive in the 1948-49 season somewhere in the vicinity of £17,200,000 for our butter and £3,200,000 for our cheese. This contract covers almost the whole of our exportable surplus of these products. The whole of our exportable surplus of eggs, furthermore, is absorbed under a contract with Great Britain which should be worth about £4,000,000 for 1948-49. The Australian Meat Board estimates that the United Kingdom contract for 1948-49 is worth £11,500,000 for frozen meat and £4,000,000 for canned meat—a total of £15,500,000. Britain has contracted to take the whole of our available surplus of meat and in 1948-49 this may mean about 140,000 tons.

Contracts for wheat with Great Britain, India and New Zealand for 90,000,000 bushels are valued at about £62,000,000. However, if the International Wheat Agreement is ratified, prices under contracts with the former two countries will be lower. The International Wheat Agreement, if fully ratified by the contracting parties, will guarantee Australia a market for 80,000,000 bushels of wheat for the next four years. This is about the average of exports of wheat (76,500,000 bushels) for the five prewar seasons, 1934-35 to 1938-39.

Lastly, more than half of Australia's total production of dried fruits is guaranteed a market by a contract with Great Britain, worth about £3,000,000 per annum.

The total value of these existing contracts is nearly £105,000,000 per annum. This is a significant figure when one considers that the total value of exports of merchandise of all types in 1947-48 was £406,000,000, of which £150,000,000 was for wool.

WHEAT AGREEMENTS.

New Zealand.

Australia has a small contract for wheat exports to New Zealand, which runs to 1949-50. Quantities and prices are negotiated each year in accordance with certain provisions in the contract. The agreement announced early this year was for the sale of 2,500,000 bushels at a price of 15s per bushel.

Great Britain and India.

Australia is selling wheat to India and Great Britain from the 1948-49 season's crop at considerably lower prices than in the previous season. The contracts, which are for one season only, stipulate a sale of 27,500,000 bushels to India at 14s. 8d. a bushel (18s. 6d. in previous season) and 60,000,000 bushels to Great Britain, the price being 13s. 8d. a bushel f.o.b. for wheat shipped before 1st April, 1949 (the price was 17s. last year). Shipments to Britain between 1st April and 31st July, 1949, will be at 12s. 10½d. per bushel; prices for shipments after that date had not yet been determined at the time of writing, and may be affected by the International Wheat Agreement. Under both contracts a considerable part of the wheat will be shipped as flour.

Furthermore, it is provided that Australia shall reduce the price to the maximum agreed to in any international agreement which may eventuate before the contracts are fulfilled. Possibly 40,000,000 bushels will remain to be shipped on 1st August, 1949, so that if the agreement is ratified, this amount will not be sold for more than the International Wheat Agreement maximum of approximately 11s. per bushel.

Last season, after supplying Great Britain and India with 108,000,000 bushels, Australia sold the remainder of her crop at prices as high as 20s. 6d. per bushel. Early this year it was predicted that the 1948-49 crop would bring £A100,000,000—about £75,000,000 from exports.

The International Wheat Agreement.

The agreement signed in Washington on 23rd March, 1949, sets maximum and minimum prices for each year, together with guaranteed quantities for importing and exporting countries.

Allocation of exports is as follows:-

	Million bushels.
Canada	203
U.S.A.	168
Australia	80
France and Uruguay ..	5
Total	456

Allocation among importers is:-

	Million bushels.
Britain	177
Italy	40
India	38
Netherlands	26
Belgium	20
Thirty-two other countries	155
Total	456

The maximum price for the first year, 1949-50, is 180 cents (approximately 11s. f.o.b. Australian ports) and the minimum is 150 cents (approximately 9s. 4½d. Australian), declining by 10 cents a year to 120 cents (approximately 7s. 3d. f.o.b. Australian ports), in the last year of the Agreement.

Before the agreement can become effective it must be ratified by exporting countries with a combined allocation of at least 80 per cent., or 365,000,000 bushels. Similarly it must be ratified by importing countries with a combined allocation of at least 70 per cent., or 319,000,000 bushels. Final date for ratification is 1st July, 1949, and if ratified the Agreement becomes effective as from 1st August, 1949.

The Agreement would lapse automatically if either Great Britain, U.S.A. or Canada failed to ratify. United States of America, however, has already ratified the Agreement.

MEAT CONTRACTS.

Under existing contracts running to September, 1950, Britain will take Australia's exportable surplus of canned and frozen meat at prices to be adjusted yearly. The prices to be paid for all classes of Australian frozen meat under the contract, as from 1st October, 1948 (together with the prices paid under the 1939-40 contract), are as follows:—

Class of Meat.	Pence per lb. A.C. F.O.B. Aust.		
	1939-40.	1947-48.	1948-49.
Lamb—			
1st quality Downs—			
20/28 lb.	...	10·93	12·08
29/36 lb.	...	10·49	11·58
1st quality other—			
20/28 lb.	7·26	10·31	11·45
29/36 lb.	6·95	9·87	10·96
Hogget—			
1st quality, up to 72 lb.	4·37	6·34	7·33
Mutton—			
1st quality W. and/or M.E., up to 50 lb.	3·51	5·56	6·55
Beef, Ox, Heifer—			
1st quality Hinds, bone-in ...	5·23	7·04	8·82
1st quality Crops, bone-in ...	3·28	4·95	6·19
Porkers and Baconers—			
1st quality, 60/120 lb.	7·5	10·29	14·38
Wiltshire Sides—			
1st quality, 50/90 lb.	8·44	12·37	16·86

Overall price increases are about 70 per cent. on the first contract in 1939-40. Lamb prices have been advanced 60 per cent. on 1939-40; prices for 1947-48 were 43 per cent. over 1939-40, so that 1948-49 prices for lamb represent a direct increase of 11-2/3 per cent. on 1947-48 prices.

Discussions are in progress between Australian officials and the British Food Ministry on prices for lamb and mutton to operate from July, 1949, but at the time of going to press no details were available. Talks on beef and pork prices will follow.

There is also a schedule of contract prices for canned meat. Sterling contract prices are:—

Corned beef, 1st quality, 6 lb. can, 93s. 8d. dozen.

Mutton, 1st quality, 6 lb. can, 95s. 1½d. dozen.

Brisket beef, 4 lb. can, 90s. 4d. dozen.

The position is that Britain will take all the meat she can get from us, but Australia is not producing enough meat to increase her export to Britain without causing a local shortage. World demand for meat at present is probably unparalleled in history, and is likely to persist for some years.

Long-term Meat Contract.

Under an agreement announced on 27th April this year Australia has undertaken to develop Northern Territory beef cattle production in return for an assured market

Air-conditioned Riverina Expresses

This month the most modern train in Australia will begin service as a daylight express between Sydney and Albury.

In addition to air-conditioning, features of this train include fluorescent lighting, comfortable seats, a broadcast system to give timetable information and to direct attention to places and objects of interest along the route, and a buffet car in which hot meals and cool refreshments are served at a counter equipped with 27 seats. Also, a train hostess will be in attendance to provide for the comfort of passengers.

It is anticipated that the second of these eight-car trains will also be operating as a Riverina Express before the end of the year. Until then the other train required for this daylight express service in both directions between Sydney and Albury will be a seven-car air-conditioned train of the same type as the two expresses operating between Sydney and Newcastle.

Seat reservation (which may be made up to fourteen days in advance of travel) is compulsory on these air-conditioned Riverina Expresses.

S. R. NICHOLAS,
Secretary for Railways.

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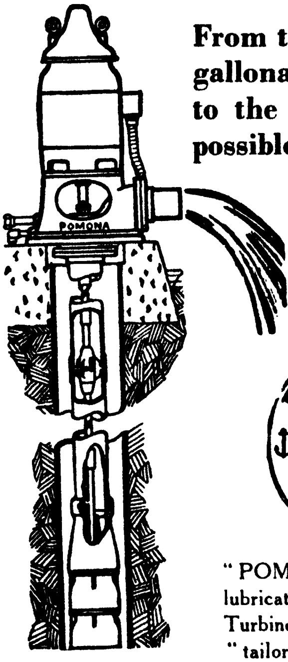

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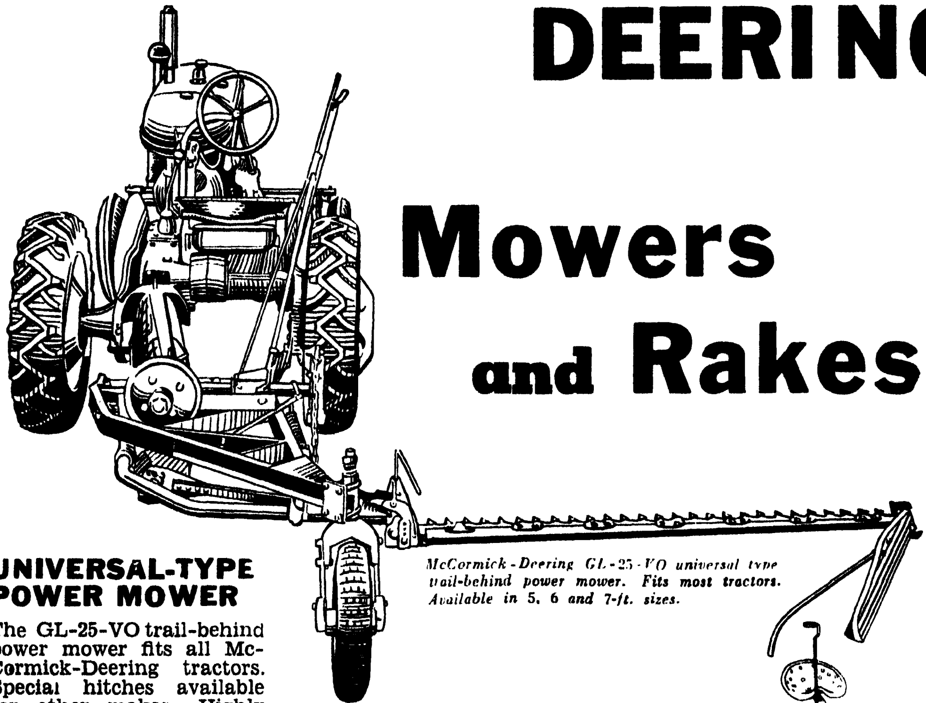

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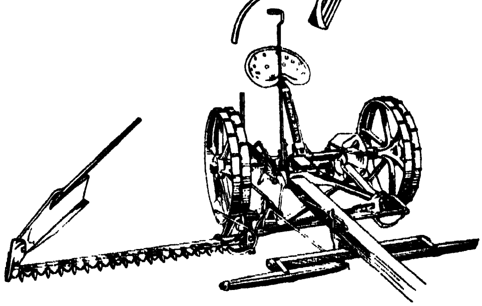

McCormick-Deering GL-No. 9 horse-drawn mower.

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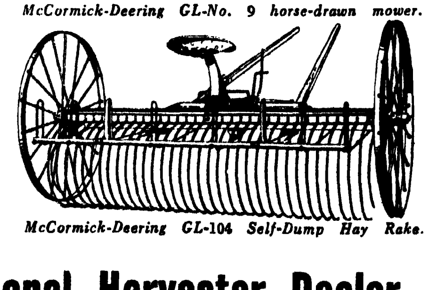

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in Britain for the next fifteen years. The United Kingdom will guarantee reasonable prices for our whole exportable surplus up to a specified ceiling, and has indicated its willingness to set limits to the fluctuation of prices within the next seven years, as in the Dairy Produce Contract. Details of prices and quantities are not yet settled.

Britain will help supply steel and road-making equipment. Capital expenditure on roads, bridges, stock-routes, bores, dams, railways, meat-works and air freight transport may run close to £50,000,000.

The agreement makes possible a potential production target of 1,000,000 tons of beef; 540,000 tons for export. A tentative assessment envisages that, of this amount, Northern Territory could produce 400,000 tons for export. Total Australian production in 1947-48 was 560,000 tons. It has been estimated that with extensive development and pasture improvement, the Northern Territory could stock close to 5,000,000 head of cattle, as against its present cattle population of 1,000,000 head. The British meat ration, however, may not be greatly affected for a considerable period, perhaps up to ten years, because of the time necessary for stocking up.

DAIRY PRODUCTS.

Thanks to long-term overseas contracts combined with internal price stabilisation, Australian dairy farmers are now enjoying a security hitherto unknown. Under a seven-year agreement with Great Britain, operating from 30th June, 1948, they are safeguarded against any sudden slump in the overseas market. Prices for the 1948 season will be 233s. 6d. sterling per cwt. f.o.b. for butter (291s. 10½d. Australian or about 2s. 7d. per lb.) and 131s. 6d. sterling per cwt. f.o.b. for choice and 1st grade cheese (164s. 4½d. Australian—about 1s. 5½d. per lb.). These prices represent an increase on last year of 30s. sterling a cwt. for butter and 15s. sterling a cwt. for cheese.

Under the terms of the contract Australia will ship to Great Britain the total exportable surplus of butter and cheese, less agreed quantities for other markets. There is a reservation of 3,000 tons of butter for markets other than the United Kingdom. Both governments recognised that it was desirable for the Australian dairying industry to maintain links with countries other than the United Kingdom in view of further developments likely in the industry.

The contract would not prevent a fairly substantial, though gradual, decline in prices if values in other countries were to fall to a low level, as annual price adjustments are provided for. However, adjustments are limited to 7½ per cent. of the price ruling in the previous year, so that if the price were to be reduced each year by the full amount permissible under the contract, the total reduction would be nearly 40 per cent.

The Commonwealth Government has decided to create a fund into which returns from exports in excess of the guarantee to the dairy farmer (2s. lb. for five years, subject to cost adjustments), would be placed to stabilise the returns from exports for the period of the contract.

It is here interesting to note the present export/domestic price ratio of butter prices as compared with what it was pre-war:—

BUTTER PRICES.

	Local.	Export.
1938-39	154/5·5 cwt.	121/7·5 cwt.
1939-40	154/5·25 ,,	132/8 ,,
1949	215/10 ,,	291/10½ ,,

Note that whereas pre-war the local market was used to support the export market, the present position is reversed. Rationing of butter in Australia, in that it restricts the amount of butter used in domestic consumption, adds to the gross receipts for total butter disposals.

DRIED FRUIT.

Under a five-year contract (from 1949 to 1953) Britain is to buy more than half of Australia's production of dried fruits—*i.e.*, Britain will purchase about 46,000 tons annually. In the first two years, f.o.b. prices will be as follows (Australian currency):—

Currants, £60 per long ton.

Sultanas, £70 per long ton.

Lexias, £63 per long ton.

These prices represent an increase of £10 per long ton for currants, and £5 for sultanas over the previous contract prices. The total value of the contract to Australia is calculated at £15,600,000.

EGGS.

Stability for the immediate future is assured by the five-year contract made with the British Ministry of Food, whereby the Australian exportable surplus of eggs will be shipped to that country. The contract covers the seasons 1948-49 to 1952-53.

It has been estimated that 315,000,000 dozen eggs will be shipped in the first three seasons, prices determined in advance. After 1951 prices will be negotiated by the two Governments at least sixteen months before the commencement of the season in which the eggs are to be delivered.

The export target anticipates an increase in production in the first two years of 22,500,000 dozen per annum. However, during the 1947-48 season production fell by 4,000,000 dozen in New South Wales alone, so that the quota will be by no means easy to achieve. Poultry farmers have been protesting for some time that the contract price of 2s. 4d. per dozen for a 15 lb. (*i.e.* average) pack was too low, and following a recent cost survey by the Commonwealth, the British Government has been asked, in May, 1949, to increase the contract price to 2s. 7d. per dozen. According to the survey, this price would be approximately equal to the average production cost for export eggs, including interest on producers' equity at 3⅜ per cent.—A. G. LLOYD (*Economics Research Officer*).

Enforcement of Potato Grading Regulations.

POTATOES which do not comply with grading regulations are frequently submitted by growers for inspection.

Since the grading regulations were gazetted in 1940 no prosecutions for such breaches have been made.

In view of the frequency of these breaches, however, it is felt that drastic action will be necessary to ensure that the requirements are more faithfully and regularly observed.

The most common fault seen is that of potatoes defective as a result of second growth, mechanical injury or greening, being included in grades from which such defects should be rigidly excluded.

A further requirement of the grading regulations is that each bag containing not less than 1 cwt. be indelibly marked in letters not less than two inches high, with the name and address of the vendor, the State in which grown, and the grade and variety of the contents.

Altogether, seven grades are provided for. The specifications of each grade are well defined, and amply cover growers' requirements in preparing this crop for market.

In their own interests, growers are strongly advised to familiarise themselves with the requirements by contacting their District Agronomist or District Potato Inspector. In addition, wall charts illustrating the requirements of the various grades are available to growers on request to the Division of Horticulture, Department of Agriculture, Box 36A, G.P.O., Sydney.

Red Mite on Export Apples.

SAMPLES of export Granny Smith apples from the Batlow district, recently submitted for examination by the Entomological Branch, were found to be heavily encrusted with the over-wintering eggs of the red mite.

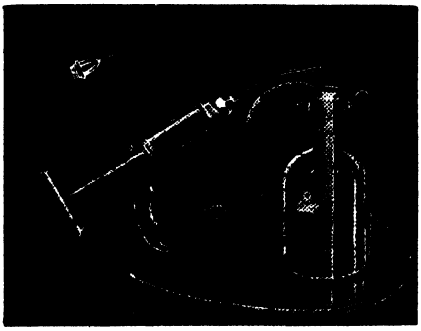
This infestation prevented shipment of some hundreds of cases of fruit to Singapore.

Red mite and red spider infestations of this type have only assumed any degree of importance since the introduction of DDT for control of codling moth.

Growers using DDT should limit the number of spray applications and be prepared to use special mite control sprays before the mites build up heavy populations.—ENTOMOLOGICAL BRANCH.

RATS and mice can gain access to haystacks by the flimsiest of bridges; hence, particular care should be taken to see that the efficiency of the straddle is not impaired.

Weeds must not be allowed to grow against the sides, nor must loose straw be left hanging down from the straddle. Ladders, pitch-forks, rakes and sticks must not at any time be left leaning against a straddle. Any such neglect will give rats or mice entry to a stack and so nullify the sound protection afforded by the straddle.



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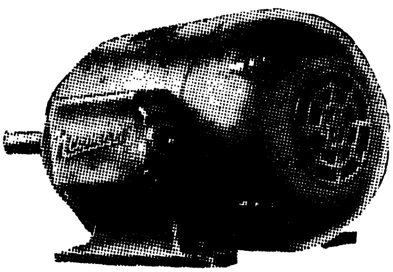

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FRUITGROWING

CONSERVATION MANAGEMENT OF CENTRAL COAST CITRUS ORCHARDS

K. D. McGILLIVRAY, H.D.A.,
Fruit Officer.

Navel Oranges at Mangrove Mountain.

THE sloping land of the central coast, most of it not naturally of high fertility, is subject to losses of soil and of soil fertility with a consequent detrimental effect on citrus fruit production which could threaten the security of the industry. Severe rainstorms, which cause soil erosion and seasonal dry periods with insufficient rain for the needs of citrus trees, are features of the climate of this area.

If citrus producers in this district are to continue to compete with highly fertile inland citrus areas they cannot afford to be wasteful of their virgin soil assets, and they must get full value for the expensive soil-improving materials which they add to their soils—both must be conserved. The period of gain from exploitive use of this type of land is short.

Stability in production and marketing are difficult to achieve in all rural industries, none more so than fruitgrowing. A great measure of stability in production will reward those who follow citrus orchard conservation management in the central coast, where the germ of stability in marketing is already alive in the well-established co-operatives.

The central coast region enjoys advantages of climate, environment and mechanical condition of the soil; few, if any, citrus areas in the world possess greater advantages for happy family and community living. However, a belief that soil erosion is inevitable is widely held in the area: that soil must wash off orchards and must be carted back is commonly accepted. Surely this is a philosophy of despair.

Continuance of citrus production has been based largely on the availability of new sites, and of new soil for resoiling the old sites. No other citrus area in the world has carried out resoiling as a general practice to the extent that it is followed on the central coast, where it is used to repair damage from erosion and as a soil improving practice to increase the depth of surface soil on the planted site.

Valley, Contour and Hillside Citrus Orchards in the Gosford District.

Contour planting, graded drainage banks and waterways save much of this costly repair work.

Insufficient rainfall at particular periods is a big barrier to full production of mature citrus trees. More water storage and irrigation schemes have been started in the last few years than ever before. The productive capacity of the central coast citrus area will not be known until still more water, which now goes past to the sea, is held for use on the land. Double the present production on the area now planted is not too much to expect. The alternative to supplementary irrigation is to cut the tree—and its production—to fit the rainfall. Skeleton pruning has been and will continue to be an important influence in stabilising production by regulating the citrus trees' productive efforts.

There is significant development in the combined management of citrus and poultry. Poultry in the orchard appears to offer a means of keeping up soil fertility and tree health at lower cost, and of supplementing income by sale of eggs and poultry meat.

Need for Intensive and Conservative Farming.

The method by which the citrus industry in this district should be developed is clearly defined—"Intensive and Conservative Farming." A sub-title could be "Greater Per Acre Production from a Smaller Area." Average production per tree at the last census, in 1945, was only about 1.6 bushels.

Good citrus sites are limited by soil, slope and situation. When sound soil management and correct planting design go together the project is being soundly handled. The writer made the following statement at an Agricultural Bureau meeting over two years ago. "Broadly, from the land-use point of view, I strongly suggest that some of the capital going into bigger and wider areas of clearing, might well be used to put a smaller area on a sounder foundation. My suggestion is a smaller area protected against soil erosion by modern contour planting design and adequate graded drainage banks and waterways, and protected against drought by the development of any water resources available."

This was part of an intensive project to introduce contour planting. The planting of over 2,000 acres of new land is proceeding now; the demand for contour designing has been strong but soil erosion headaches of the future are certain on most of the new square plantings.

Special Need for Maintenance of Fertility and Productive Capacity.

There are special reasons why the fertility of these horticultural lands—producing about 1 million bushels of citrus fruit a

year—should be maintained. Soil fertility can be kept up and soil losses kept down if certain difficulties are overcome. Some of these difficulties occur with all fruit-growing; others apply particularly to the central coast area.

1. *Suitable Orchard Sites Are Limited.*—It can be accepted that suitable sites are limited in number and area in this district. Looking around the older settled parts of the district it can be seen that there are practically no new sites on virgin land which are better than those already planted. Replanting of old land is going on now for that reason. The same thing is happening in the newer areas. Most of the suitable citrus land on the coastal highlands (Mangrove Mountain) which is within a reasonable distance of facilities and services, is now either planted, being planted, cleared for planting or alienated and subdivided into orchard blocks.

What happens if we cannot continue to get good production from the good sites? The industry moves to inferior land or to more distant areas. The stability of the industry depends on keeping the good sites in use.

2. *Citrus Trees Respond Rapidly to Changes of Environment—Good or Bad.*—It may be stating the obvious to say that profitable citrus crops depend on healthy trees in a fertile soil. Soil losses and lowered soil fertility affect the productive capacity of even comparatively young trees, and can seriously impair tree health, thus reducing the owner's income from the trees. This is not a long term effect, but is of immediate concern.

It is not suggested that if virgin fertility is maintained all will be well. Soil improving materials such as animal manures, fertilisers, copper, magnesium, cover crops and re-soiling, are added to central coast orchards, and conservation must extend to these too.

3. *The Central Coast Produces 12½ per cent. of the Commonwealth Citrus Crop.*—About 800 citrus growers on the central coast produce approximately one million bushels of citrus fruit a year. Within the last three to four years about 3,000 acres have been cleared for new orchards, and are now being planted with citrus trees and passionfruit. Planted as an inter-crop with citrus, passionfruit is an important fruit crop. A large proportion of the State's passionfruit is grown here.

4. *The Amount of Capital Invested in Facilities and Services is High.*—These include packing houses, case mills, transport facilities, and the enterprises which supply the citrus grower with spray materials, fertilisers, and all the goods and services which he requires. Much of the capital is the grower's own, in co-operative enterprises.

Special Difficulty in Maintaining the Fertility and Production.

1. *One-crop Farming.*—Do fruitgrowers realise that they are up against the troubles that come to all one-crop farmers? One-crop farming has become recognised as a destructive form of land usage. Soil and soil fertility losses can be kept down and yields maintained by rotation of crops and the use of stock. With few exceptions

Avoca Beach—Typical of the Pleasant Places for Recreation Available to the Citrus Growers of the Gosford District.

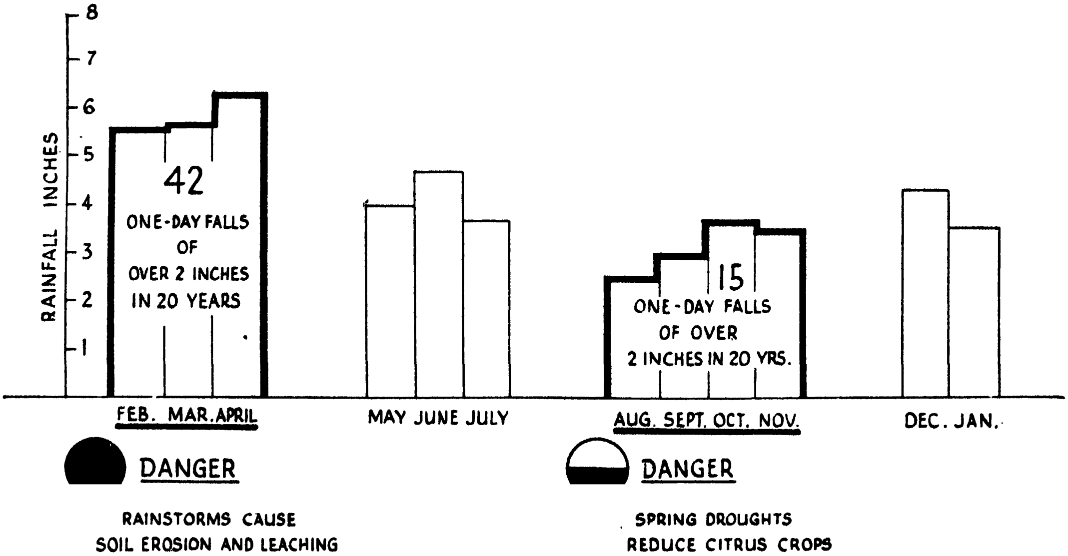

Diagram showing Average Monthly Rainfall (1928-47) at Somersby (Coastal Highlands—Mr. G. C. Linton's property).

Note the "danger spots" due to severe autumn rainstorms and dry periods in spring. The large figures in the columns show the total number of one-day falls of over 2 inches during the twenty years for the respective periods.

fruitgrowers are denied the benefits of such a rotation. Their crop—fruit trees—may occupy the same site for fifty years, and if it is a good site, they will want to replant it with fruit trees. One-crop farming at its worst! Probably no other form of land usage demands more attention to soil and fertility conservation than fruitgrowing. Central coast citrus growers are in a similar position to all other fruitgrowers.

2. *Virgin Fertility of Central Coast Soils.*—The temperate climate of the central coast citrus region (most of it within 25 miles of Gosford), the good mechanical condition of most of the soil, and nearness to Sydney (the biggest fruit market in the Commonwealth) all favour citrus production. Many settlers have been attracted by these advantages and by pleasant living conditions, amenities, family opportunities and facilities for recreation.

It must be recognised that, although much of the citrus land, particularly on the coastal highlands, is well-drained, promotes healthy root growth and is easy to cultivate, it is not highly fertile.

The industry is rapidly expanding on the coastal highlands. When the correct soil improving materials are added to the excellent mechanical condition of most of the coastal

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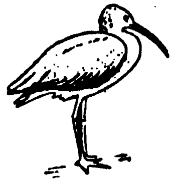

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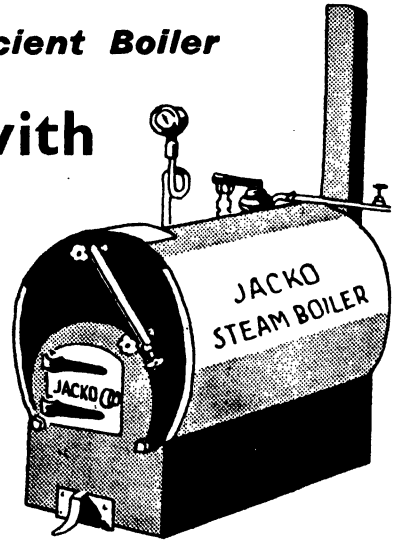

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Green and Black Peach Aphid, Black Cherry Aphid. Spray with Aphidol, 1 in 40, in the late dormant season, or with Winsol, 1 in 40, before July 31.

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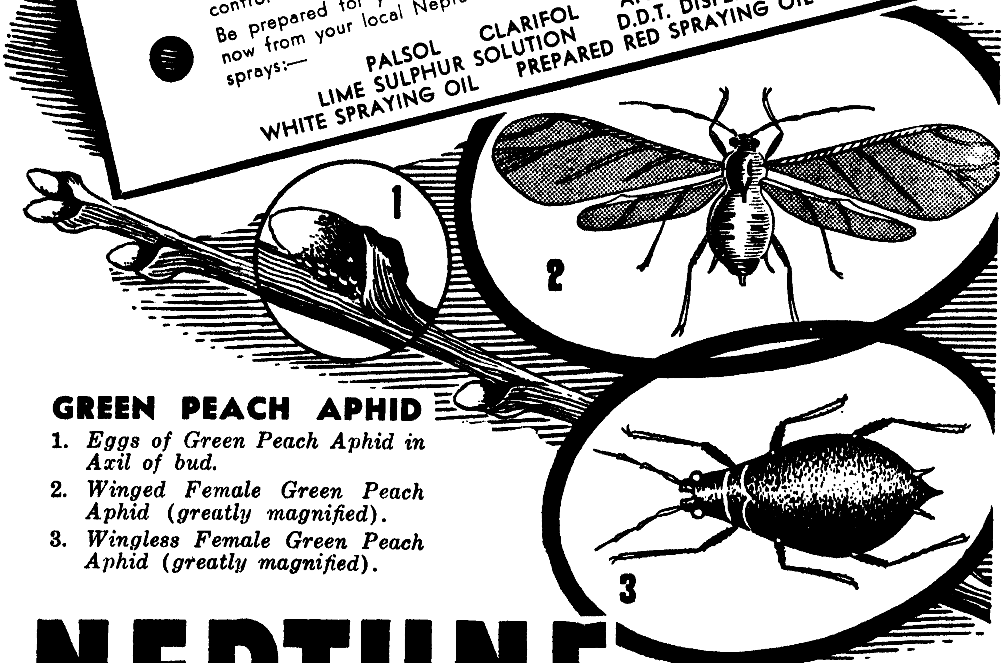

GREEN PEACH APHID

1. *Eggs of Green Peach Aphid in Axil of bud.*
2. *Winged Female Green Peach Aphid (greatly magnified).*
3. *Wingless Female Green Peach Aphid (greatly magnified).*

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RAINFALL RECORDS, CENTRAL COAST CITRUS AREA, 1928-47.

	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Yearly Total.
	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Pts.	Inches
Somersby (Mr. G. C. Linton).													
*Average rainfall ...	353	565	568	633	399	465	359	244	295	374	350	431	50
*Number of one-day falls of 2 inches and over...	2	11	19	12	8	8	5	2	7	4	2	7	...
Gosford.													
*Average rainfall ...	299	465	537	586	424	366	380	246	278	311	297	377	46
Narara Viticultural Nursery.													
*Average rainfall ...	308	485	490	605	382	414	336	225	277	342	305	356	45
*Number of three day falls of 2 inches and over	6	11	15	20	14	12	9	7	7	8	5	8	...
Wyong.													
*Average rainfall ...	263	367	535	511	395	379	307	238	255	309	306	337	42

* Twenty years, 1928 to 1947.

highland soil good results follow. However, both virgin fertility and added fertility must be conserved.

3. *Rainfall and Sloping Land.*—Most central coast citrus groves are on sloping land. Early settlers liked slopes, but not steep slopes. A general observation is that the slopes of new land recently cleared are steeper than many of the older blocks.

Clean tillage, generally practised in the summer months, produces an easily eroded surface. The stage is then set for the destructive work of the violent rainstorm—which becames greater as the slopes increase. This practice is responsible for most of the soil outside the fence below the orchard, and for the silt in dams and creeks.

An analysis of past rainfall records (see table) points clearly to special difficulties in keeping central coast citrus soils in a fertile and productive condition, while the "danger spots" diagram, the graph on page 360 shows clearly the main reasons why conservation management is so necessary. Graphs are sometimes unattractive mazes of figures and lines, which are skimmed over by the reader, but it is hoped that this simple diagram of the rainfall incidence in this area will emphasise the difficulties of maintaining soil fertility and productive capacity.

It should not be thought that the dry periods shown to occur in the spring, and the soil-eroding rains in the summer and autumn do not occur in other months than those underlined. They do, but not as often, and the seasons are not as significant.

The shedding of main crop fruit from older trees due to dry weather in the spring and early summer is often followed by late flowering and setting of second-crop fruit. When markets are bright and not critical, central coast second-crop oranges may bring good prices. Much of this fruit, however, particularly Valencias, is poor in flavour and keeping quality, thick-skinned and low in juice. There is no doubt that second-crop fruit has shown good returns to growers at times, but when better and sounder oranges are offering, second-crop oranges are likely to become unsaleable.

There cannot be security in an economy that depends for support on second-crop oranges. The brightest hope for the producer of second-crop oranges is that the consumer will be in a tight corner for fruit, and will be compelled to buy an inferior article—surely not a good basis for business. Increasing production from new and established plantings looks like blotting out hopes of this kind in the future.

(*To be continued.*)

VITAMIN A DEFICIENCY IN POULTRY

(Also Called Avitaminosis A or Green Feed Deficiency)

Reduces Production and Disease Resistance

D. G. CHRISTIE, B.V.Sc., Veterinary Officer.

THE value of a supply of green feed to poultry has long been recognised and in recent years careful research has shown that its beneficial effect is due mainly to the supply of two vitamins, namely, vitamin A and riboflavin.

Vitamin A is essential for the maintenance of general health. It is concerned particularly with the health of the mucous surfaces of the body, for example, those of eye, nose, mouth and gullet; a deficiency results in a lowered resistance of these membranes. It is also essential for maintenance of a normal level of production of eggs with a high content of vitamin A.

What Are Vitamins?

Vitamins are substances required in minute amounts by animals for the maintenance of normal body processes. Once requirements are met, there does not appear to be any advantage in giving additional amounts of a particular vitamin. Unfortunately, this fact is not widely appreciated and undue emphasis is often placed on the importance of these substances, with the result that many become vitamin conscious to the neglect of other equally important considerations. This imbalanced outlook may lead to the expectation of almost miraculous results from the use of a vitamin supplement and a growing carelessness in general husbandry methods.

The Nature of Vitamin A.

Vitamin A is a fat-soluble, almost colourless substance present in large quantities in fish oils and in animal tissues such as liver, egg yolk and whole milk. It is fairly unstable when mixed with feed. It is not present in plants or plant products as vitamin A, but in the form of a yellow coloured "parent substance" called provitamin A or carotene, which yields vitamin A when eaten by the bird. Green feeds and yellow vegetables such as carrots and pumpkins contain carotene in appreciable amounts. Egg yolks may contain considerable amounts of colourless vitamin A, but only small amounts of carotene, their yellow and red

Fig. 1.—Typical Appearance of Fowls with Vitamin A Deficiency.

[*University of California photo*.

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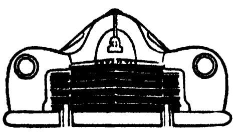

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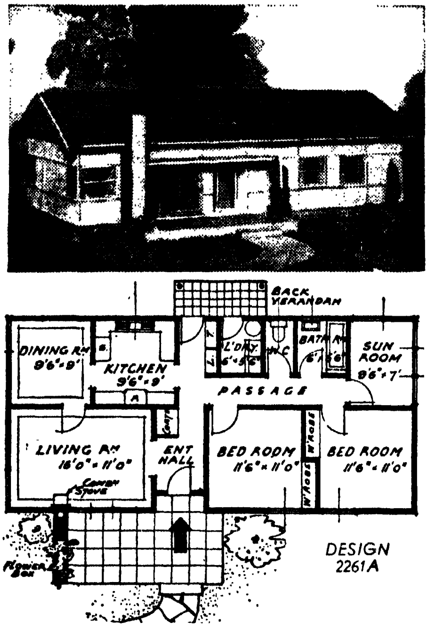

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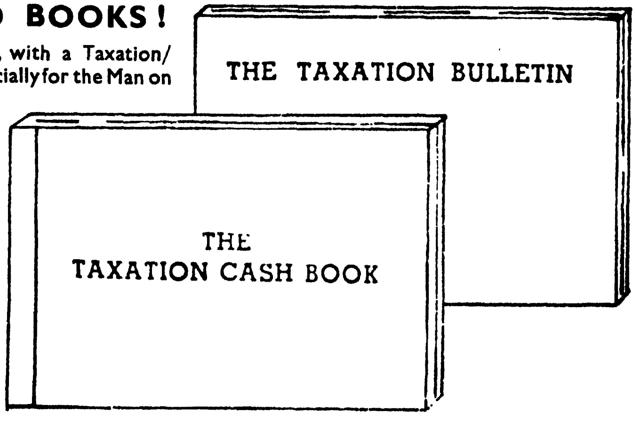

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Fig. 2.—Cheesy Material in the Eye of a Fowl with Vitamin A Deficiency.

[*University of California photo.*

colour being mainly due to a yellow pigment called xanthophyll which is present in yellow maize.

Symptoms of Vitamin A Deficiency Disease.

Symptoms due to vitamin A deficiency will appear in birds on a ration containing little or none of the vitamins, after an "incubation period" which will vary according to the amount of vitamin A stored in the birds' tissues, particularly the liver.

While a lot of cases of severe vitamin A deficiency still do occur, particularly during a dry summer, most farmers realise the necessity for vitamin A supplementation of the ration. Unfortunately, mild cases of vitamin A deficiency are commonly noted in which the owners concerned are often convinced that the supplementation with vitamin A is adequate. In such instances it can be shown that poor quality green feed, lucerne meal or fish oil was used. These mild deficiencies may just set back the flock a little in production, but the unthriftiness and consequent lowered resistance of the birds will cause increased losses from worm infestation and diseases such as coryza and infectious laryngo-tracheitis. If a mild deficiency is continued over a long period, all reserves of vitamin A in the body tissues will become depleted and definite symptoms of vitamin A deficiency disease will be shown.

Chickens.—The time of onset of symptoms will depend on the amount of vitamin A fed the parent hens, and hence the amount stored in the egg yolks. Thus, in the case of chickens hatched from eggs with a normal vitamin A content, it may be three to four weeks after hatching, even on a very deficient ration, before symptoms are noted. On the other hand, chickens hatched from eggs containing little vitamin A will develop symptoms of a deficiency much earlier.

Affected chickens show a cessation of growth and appear drowsy and dejected. There is leg weakness and inco-ordination of movement, the chickens walking with a staggering gait. The plumage becomes ruffled, combs and wattles are usually pale, and there is a lack of pigment in shanks and beaks of those breeds of chickens which normally show it. The membrane around the eye becomes dry and thickened; later the eye waters profusely and a whitish material collects under the swollen lids. Death often occurs in chickens before the eyes become affected.

Growing and Adult Birds.—The younger the bird the quicker the onset and the more marked the effects of a severe deficiency.

Fig. 3.—Advanced Case of Vitamin A Deficiency, showing Back of Throat and Gullet Studded with Pustule like Nodules.

[*University of California photo.*

Thus, in young pullets symptoms could be expected in three to four weeks from the time the deficiency applied, while in grown cocks the onset of symptoms may be delayed for four months.

A rapid drop in egg production is followed by marked emaciation and weakness. Feathers become ruffled, a watery discharge issues from the nostrils and eyes, and the eyelids are often glued together. As the discharge continues an accumulation of milky white caseous material collects in the eyes giving a typical "bung eye" appearance. The nasal cavities are frequently plugged with this cheesy material.

In the latter stages of the disease, the eyes become filled with this white exudate to such an extent that it is impossible for the bird to see unless the mass is removed, and in many cases the eye is destroyed. On opening the beak, little pustule-like nodules may be seen at the back of the mouth and extending to the beginning of the oesophagus or gullet. Their presence is a definite proof of a vitamin A deficiency in all classes of poultry.

At about the same time as the eyes become affected, there is involvement of the breathing tubes. They contain material varying from thick mucus to a firm, cheesy core which may render breathing difficult and may cause death from asphyxiation.

The course of the disease may vary from a few to fourteen days or even longer, and death usually occurs in from one to five days after the eyes become affected.

As previously mentioned, the train of symptoms described above may not be apparent in the early stages of a mild deficiency. Symptoms in such cases appear slowly and the disease is most insidious. Before an accurate diagnosis is made, quite heavy losses may occur through lowered resistance to other diseases, through loss of eggs and a permanent stunting of young stock.

Turkeys require from two to four times as much vitamin A as chickens according to one authority. As a result, they show more marked symptoms when a deficiency occurs. Young turkeys are listless, have an unsteady gait and tend to sit with sagging wings, drooping head and closed eyes. The third eyelid is swollen, dry and rough and is often sprinkled with a fine chalk-like exudate. Some birds show nasal catarrh with sneezing and coughing, and sinusitis is a very prominent symptom.

On a vitamin A deficient diet, turkey poults show symptoms as early as four weeks, and unless the deficiency is corrected, an entire batch may die within six weeks of hatching.

Ducklings are extremely susceptible to vitamin A deficiency and high mortality occurs unless the deficiency is relieved A

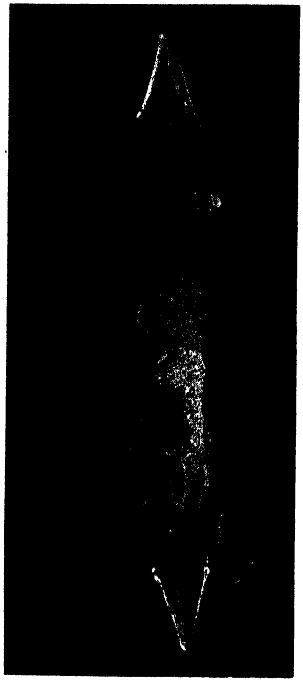

Fig. 4.—Head, Throat and Gullet Split Down to show the Nodules on the Gullet Wall, due to Green Feed Deficiency.

mucoid discharge occurs from the eye ("white eye") and staggering or paralysis is also shown.

Post-mortem Findings.

Previous mention has been made of the presence of caseous pustules at the rear of the mouth, extending back to the beginning of the oesphagus or gullet. In some cases they extend down the gullet into the crop. The infraorbital sinus (in front of eye) is distended with cheesy material. Cheesy cankers are present in the nasal cavity,

mouth, throat, larynx and trachea (breathing tube). They are easily removed from the surface of the underlying membrane, thus differentiating the condition from the canker or diptheritic form of fowl pox.

The bursa of fabricius (a pouch-like organ opening into the top of the vent in young birds) is usually filled with a white, flaky exudate. The kidneys may be swollen and filled with urates, presenting a dusted apearance. A similar deposit of urates may be "dusted" over the intestines, heart and lungs (visceral gout).

The Disease is Not Infectious.

Unfortunately, this disease is commonly grouped with the "roup" diseases and given the name of "nutritional roup." This leads to confusion with infectious laryngo-tracheitis, fowl pox and coryza, all of which are infectious and communicable conditions, whereas vitamin A deficiency disease is not infectious and cannot be transmitted.

Differential Diagnosis.

Fowl pox, the chronic form of infectious laryngo-tracheitis, and some forms of coryza may be confused with this vitamin A deficiency. While in uncomplicated cases of the diseases mentioned, the pustules on the gullet (typical of vitamin A deficiency) would not be present, if there is an accompanying vitamin A deficiency, the tell-tale pustules will be found, and an erroneous diagnosis of a straight-out vitamin A deficiency may be made. When a combined vitamin A deficiency and infectious disease operates, careful consideration of other features characteristic of these infectious diseases will generally lead to a correct diagnosis.

Fowl Pox is an infectious disease caused by a virus, and primarily affects the comb and wattles, producing wart-like lesions. The eye, mouth and nasal cavities often show lesions which appear typical of vitamin A deficiency, but if these cheesy cankers in the mouth and throat in fowl pox are lifted off the mucous membrane with a fingernail, they will leave a raw base. In vitamin A deficiency cheesy deposits are only loosely attached to the membrane.

Chronic Infectious Laryngo-tracheitis and some forms of coryza cause coughing and discharges from the eyes and nostrils. The lining membrane of the larynx and windpipe is congested (reddened), but this does not occur in vitamin A deficiency. Cheesy canker deposits are present in chronic infectious laryngo-tracheitis.

In the case of turkeys, infectious sinusitis may be confused with vitamin A deficiency. A departmental leaflet on sinusitis is available.

In ducks, the so-called "white eye" symptoms may be confused with a possibly infectious "white eye," and the paralysis with that due to tick fever, which is common in ducks in inland areas.

Treatment of the Disease.

The supply of vitamin A to birds suffering from the deficiency disease is followed by a dramatic response, and there is a rapid improvement in the whole flock within seven days. Best results will be obtained if up to four times the required amount of vitamin A oil is given for the first week, and thereafter the normally recommended level. Badly affected birds should be dosed individually with a teaspoonful of vitamin A oil to aid recovery.

Notes on Vitamin A Supplements.

Green Feed.—Two-thirds of an ounce per bird (4 lb. per 100 birds) of freshly-cut, leafy, green feed supplies adequate carotene to meet the vitamin A requirements of all classes of birds. Stalk contains little carotene, and the carotene content of green feed decreases as the plant matures and the stalk develops. Up to 1 oz. per bird (6 lb. per 100 birds) of this poorer-quality green feed would be required to furnish sufficient carotene. The carotene content of cut green feed soon falls, so that the material should not be cut and chaffed until immediately before feeding.

In the case of any particular green feed crop, the plants of a darker-green colour will have a higher carotene content, but this comparison does not hold between two different crops. Green feed, in addition to providing carotene, furnishes riboflavin, pantothenic acid, vitamin B complex, vitamin K and protein. Up to a 10 per cent. saving in grain and mash consumption may be effected by supplying as much green feed as the birds will eat, or by allowing them good grazing.

By-products from vegetable crops such as pea vines, bean vines, turnip or carrot tops are excellent sources of carotene and when available can be used in place of the usual green feeds.

For further details on green feed, the reader should consult the Departmental pamphlet "Green Feed for Poultry." A valuable discussion on the complete replacement of green feed in breeding, growing and laying poultry rations is given in the Poultry Experiment Farm Extension Bulletin No. 3, also obtainable from the Department.

Lucerne Meals.—The enormous variation in the carotene content of lucerne meals is due to different methods of curing and subsequent handling, and the age of the meal. Because of this variation, lucerne meal cannot be relied on as the only vitamin A supplement. However, apart from its vitamin A content, lucerne meal plays an important role in rations, as it furnishes the other vitamins contained in appreciable amounts only in green feed, and, in addition, it is high in protein. It thus forms a valuable supplement to fish oils when green feed is unavailable, because it supplies those factors absent from fish oils.

Yellow Maize contains a yellow pigment, cryptoxanthin, which is a provitamin A. If yellow maize forms a high proportion of the ration, part of the vitamin A requirements will be met. This provitamin A diminishes on storage, and maize a year old may be practically worthless as a vitamin A supplement.

Carrots.—One to 2 oz. of chopped up carrots per bird per day will furnish vitamin A requirements, and in addition will replace 10 per cent. of the grain requirements.

Silage.—Both lucerne and grass silage can be used as carotene supplements. Well-made silage may contain almost as much carotene as the original green feed; the carotene content is improved by pouring diluted molasses over the material as it is ensiled. Surplus growth of green feed might well be conserved as silage on some farms. Further details on making silage may be obtained on application to the Department. Occasionally some samples of silage may cause discoloured yolks and this can be checked by breaking open some eggs.

Fish Oils.—When fish oils are being used as the only source of vitamin A, the rations for different classes of stock should contain the following amounts of the vitamin:

Growing Stock—1,400 International units per lb. of feed.

Laying Stock—3,100 International units per lb. of feed.

Breeding Stock—4,500 International units per lb. of feed.

The following table gives the amounts of oils of different potencies necessary to meet the above requirements.

Potency of Oil in International Units per Gram.	Pounds of Oil per 100 lb. of Mash.			
	For Chicks.		For Layers and Breeders.	
	All Mash Ration.	Mash and Grain Ration.	All Mash Ration.	Mash and Grain Ration.
	oz.	oz.	lb. oz.	lb. oz.
800	8	12	1 0	2 0
1,000	5	8	0 11	1 6
1,500	4	6	0 8	1 0
2,000	3	4	0 6	0 12
2,500	2½	3½	0 4½	0 9
3,000	2	3	0 4	0 8
5,000	1	1½	0 2¼	0 5

The following points should be observed when using vitamin A oils:—

1. Buy oils on the basis of their vitamin A content, and not on their apparent cheapness. An oil of 3,000 International units per gram is naturally worth twice as much money per gallon as one with 1,500 units, since only half the quantity is needed to attain the same level of vitamin A in the ration (see above table).

2. The vitamin D content of oils has no relation to their vitamin A content.

3. Vitamin A is very stable when stored in sealed tins away from light in a cool place. It is fairly rapidly destroyed, however, when mixed with feeds, especially if the feed contains manganese supplements or charcoal, which assist the destruction. Vitamin A oils should not be mixed with feeds more than a week before the feed is to be fed. Although the destruction for up to several weeks is usually small, there is a definite risk of high or even practically complete destruction, so that frequent mixing is advisable.

4. To facilitate incorporation into the ration the oil should be first mixed with a little bran, which is then mixed into the rest of the feed.

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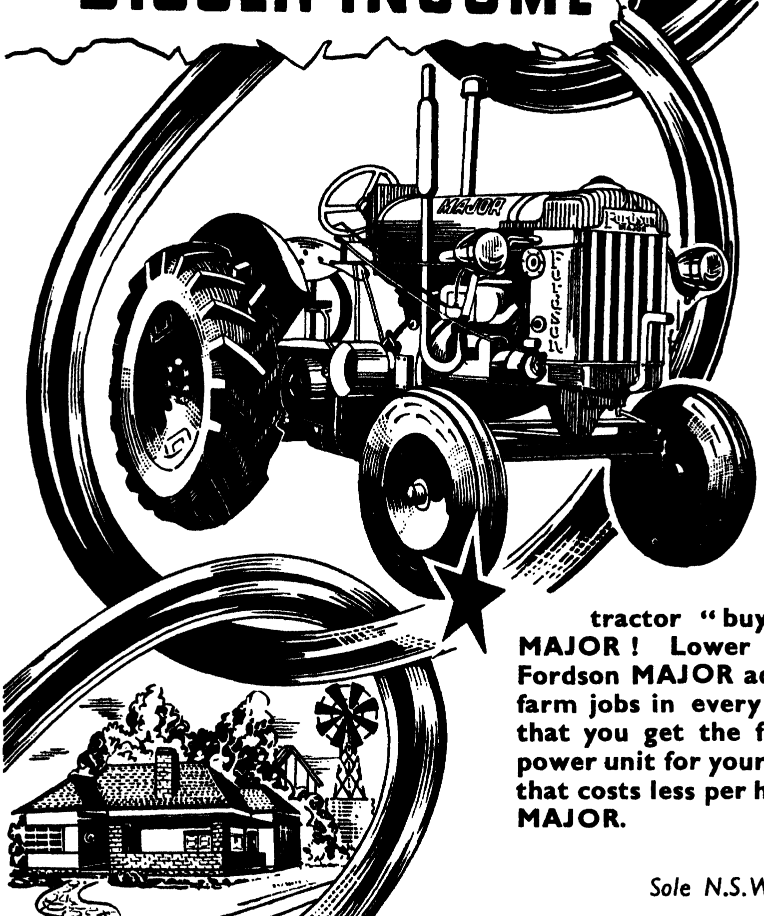

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PLANT DISEASES

Notes contributed by the Biological Branch
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VEGETABLE SEED TREATMENT

VEGETABLE growers frequently complain that seeds fail to germinate satisfactorily, and some are inclined to blame the quality of the seeds on all occasions.

Poor germination may be the result of using seed of low vitality, but farmers in New South Wales are largely protected from this hazard by Government regulations which set a standard of germination for all merchandised vegetable seeds. In general, therefore, the grower can expect to buy seed of good quality and should look for other possible causes of failure when poor stands occur.

In practice, sample seeds are purchased on the open market by the Department of Agriculture and are tested for germinating ability by departmental officials. The larger seed merchants also employ their own staff to check the vitality of their seeds.

Good germination is not the only factor which determines good stands in the seed-bed or in the field. Most soils are infested with parasitic fungi, many of which are destructive mainly during the germinating and early seedling stages. On other occasions the seed coats and soils are contaminated with pathogens which are capable of attacking the seedling and continuing the attack throughout the life of the plant.

Methods of Seed Treatment.

Seed is treated for three separate purposes—

(*a*) The destruction of parasites which are carried *inside* the seed; (*b*) the destruction of parasites which are carried *on*

Fig. 1.—Bacterial Canker of Tomato.
Seed treated with 0·6 per cent. acetic acid to destroy seed-borne bacterial canker may be purchased from the better seeds merchants.

the seed; and (*c*) the protection of the germinating seed from attack by parasites which are present in the soil.

The internal parasite is the most difficult to control and, in the majority of cases, can be destroyed only if the seed is soaked in water heated to a temperature which will destroy the parasite, but will not unduly injure the seed. This warm water treatment is satisfactory for many small seeds such as tomato, cabbage, celery, etc., but cannot be used with larger seeds such as beans.

Fig. 2.—Black Rot of Crucifers.
This disease is controlled by the warm water treatment of seed.

Solutions of poisons, *e.g.*, mercuric chloride, are effective in destroying parasites which are borne externally. Many dusts containing copper or organic compounds of mercury or other bactericidal or fungicidal organic materials are equally as useful as mercuric chloride and have the added value of protecting the seedlings from early attack by pathogens from the soil.

Departmental recommendations for the treatment of seeds of various vegetables are given in the accompanying table. *As some of the dusts are harmful to seeds if used in excess quantities, care should be taken to sieve out any free dust from treated seeds.*

RECOMMENDED TREATMENTS.

Beet, Silver Beet.—

Dust with copper dusts at rate of 4 level teaspoonfuls per lb. of seed, or one of the abovementioned proprietary organic-mercury dusts at rate of 1 level teaspoonful per lb.

Broccoli, Brussels Sprouts, Cabbage, Cauliflowers, Kale, Kohlrabi, Radish, Turnip.—

Treat in hot water before sowing. Tie the seed loosely, ¼ lb. at a time, in cheese cloth bags and suspend in a large volume of water (a kerosenetin full) previously heated to 122 deg. Fahr. (50 deg. C.). Use a small lamp to maintain the temperature or insulate the tin in a box of straw. After treatment, spread out the seed to dry in the shade. Time of treatment: Cabbages, 25 minutes; other crucifers, 18 minutes. Do not treat weak seed, and if in doubt, make a trial first with a small quantity of seed. *Do not dust seed of plants of the cabbage family with copper dusts; mercury dusts may be used.*

Carrot, Lettuce, Spinach.—

Before sowing, dust seed with a copper dust or one of the proprietary organic-mercury dusts.

Celery.—

Treat in hot water before sowing (see cabbage), 10 minutes at 135 deg. Fahr. (57 deg. C.). Quickly spread out to dry in the shade. Do not treat old or weak seed.

Cucumber, Pumpkin, Rockmelon, Squash, Watermelon.—

Dust seed before sowing with a copper dust or one of the proprietary organic-mercury dusts.

Onion.—

Treat seed in hot water (see cabbage) for 25 minutes at 122 deg. Fahr. (50 deg. C.).

Pea, Broad Bean.—

Dust seed before sowing. Use copper dusts at a rate of 2 oz. per bushel, organic-mercury dusts at rate of 1 oz., and "Spergon" or "Tetroc" at 1½-2 oz. per bushel. Peas or broad beans which have been or are to be treated with nodule-producing bacteria should not be dusted with copper or organic-mercury dust. "Spergon" or "Tetroc" may be used in this case. "Spergon" and "Tetroc" also "lubricate" the seed and are recommended when pea seed is to be sown by a drill or planter.

Fig. 3.—Damping-off of Peas.
A flat planted with peas showing how dusting the seeds protects them from pre-emergence damping-off. The same number of seeds was planted in each row.

Potato.—

Dip in acidulated mercuric chloride (corrosive sublimate), "Hortosan" or "Aretan." Acidulated mercuric chloride is prepared by dissolving 4 oz. of the chemical in 1 quart of commercial hydrochloric acid and adding to 25 gallons of water. Dip for 10 minutes. Use wooden container. Plant immediately or dry thoroughly and store in a dry place. Discard solution after fifteen dippings, or then extend time of treatment 2 minutes for each additional dipping. For "Hortosan" and "Aretan," follow directions on containers.

Tomato.—

Before sowing, dust seed with copper or organic-mercury dusts, or steep in mercuric chloride (¼ oz. in 25 pints of water) for 5 minutes, wash 15 minutes and dry. Tomato seed may be treated in water at 122 deg. Fahr. for 30 minutes.

For the control of bacterial canker seed of doubtful origin should be soaked in a 0.6 per cent. solution of acetic acid (glacial) for 24 hours. Following treatment, the seed should be dusted after drying.

All chemicals mentioned above are poisonous, and, together with treated seed, should be kept away from children and animals.

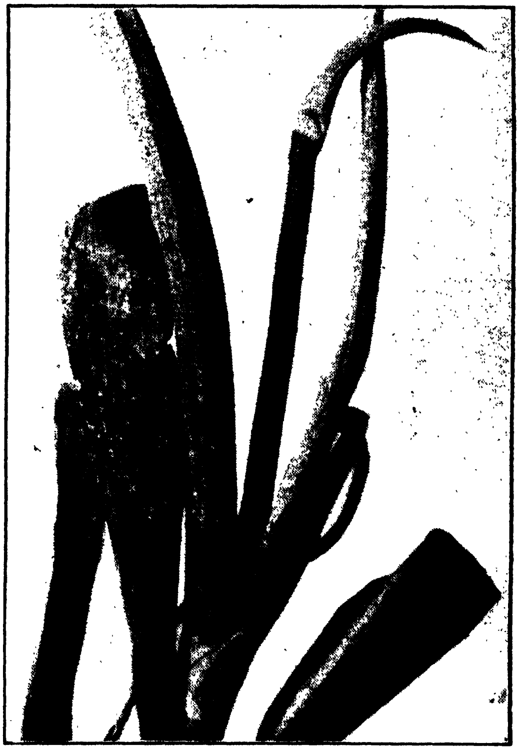
Downy Mildew of Onions

DOWNY Mildew, caused by the fungus *Peronospora destructor*, is a disease which occurs every spring in coastal onion crops; it is frequently responsible for considerable reductions in yield. In wet seasons the disease is also of importance in inland onion-growing areas of the State.

There are three main sources of infection for a young crop: diseased leaves may have been left in the field from a previous crop, carrying resting spores capable of infecting the new crop; the disease may be carried with the seed; or it may spread from infected plants to healthy ones.

Downy mildew of the onion is, unfortunately, one of the diseases which is difficult to control by spraying. This is partly because the waxy surface of the onion leaf is difficult to wet and spray deposits are, therefore, difficult to establish, and partly because the fungus spreads internally through the leaf tissue and sends out spore-bearing structures which liberate spores capable of infecting neighbouring plants.

Control measures are, therefore, restricted to crop rotation, the cleaning up and burning of infected leaves and bulbs, the selection of well-drained soils in sites where air circulation is encouraged, and seed treatment with warm water.

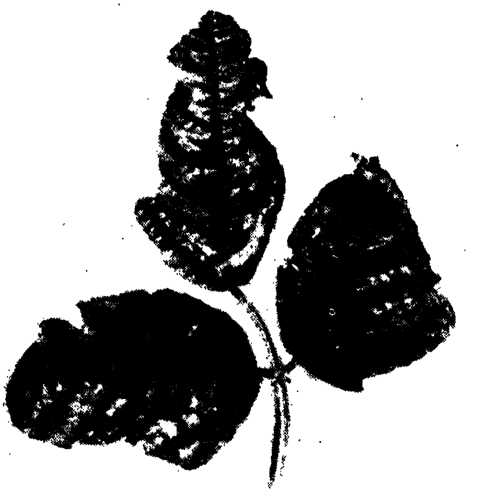


Downy Mildew of Onion.
The leaves are blighted and covered with a furry outgrowth of the fungus.

The Scald Disease of French Beans

THE disease of French beans known as "Scald" has been definitely recorded only in the Gosford-Wyong district of New South Wales.

The disease is characterised by the death of the margins and intervenal areas of the leaves, stunting of plants, dropping of flowers and low yields. The scalding or death of the leaf tissue is preceded by a chlorosis (pale green colour) of the leaves.



Bean Leaf Affected with Scald.
Showing death of edges of leaves and pale leaf colour between the veins.

Association between Scald and Seed Origin.

One feature of interest concerning this disease is the association between scald and the origin of the seed. Growers in the Dooralong, Berkeley Vale, Tumbi Umbi, Wamberal, Matcham and Terrigal sections of the Gosford-Wyong district have found that seed produced in the acid soils of their own or other farms in the district is liable to produce scalded plants when sown again on such acid soils. Seed grown outside their district almost invariably produces crops which are free of scald. There are, however, a few recorded cases of scald developing in crops grown in the Gosford district from seed produced outside the district.

Recent investigations, a preliminary report on which has been published elsewhere*, have provided evidence that scald of beans, like whiptail of cauliflowers, is a molybdenum deficiency disease.

Control of Scald.

On the existing knowledge of this and other molybdenum deficiency diseases, it would appear that scald may be prevented in bean crops by one of the following:—

1. *Use of Seed Grown in Other Districts.*—No scald has been recorded in crops from seed grown at Maitland, Dubbo, Wellington and Tenterfield. Most South Coast seed has produced scald-free crops.

2. *Use of Lime or Dolomite.*—Pot experiments carried out some years ago by Dr. Parbery, of this Department, showed that the addition of lime or dolomite to the soil, before planting, would prevent the development of scald. Quantities of from 1 ton to 3 or 4 tons per acre would probably be required and, to be effective, lime or dolomite should be applied at least a month or two before planting the crop.

3. *Use of Molybdenum Compounds.*—No benefit may result from use of molybdenum compounds where the seed used has been produced on a soil reasonably high in available molybdenum, or where lime or dolomite has been applied to the soil. However, where lime or dolomite has not been used and where there is any doubt about the seed, it is considered that sodium molybdate or ammonium molybdate would be worthy of trial. Further experimental work is required before specific recommendations can be made concerning the control of scald by the use of these chemicals. Should any growers be desirous of experimenting themselves along these lines, it is suggested that crude (43 per cent.) sodium molybdate (costing about 5s. 6d. per lb. retail) be mixed with the fertiliser at the rate of ¼ lb. to ½ lb. of the material per bag of fertiliser (160 to 187 lb. per bag). For the autumn planting, where spraying for bean fly is carried out, an easier method of application would probably be to add a small quantity of sodium molybdate or ammonium molybdate to the first spray applied.

* Wilson, R. D.—Molybdenum in Relation to the Scald Disease of Beans. *Aust. Jour. Sci.* 11, 1949.

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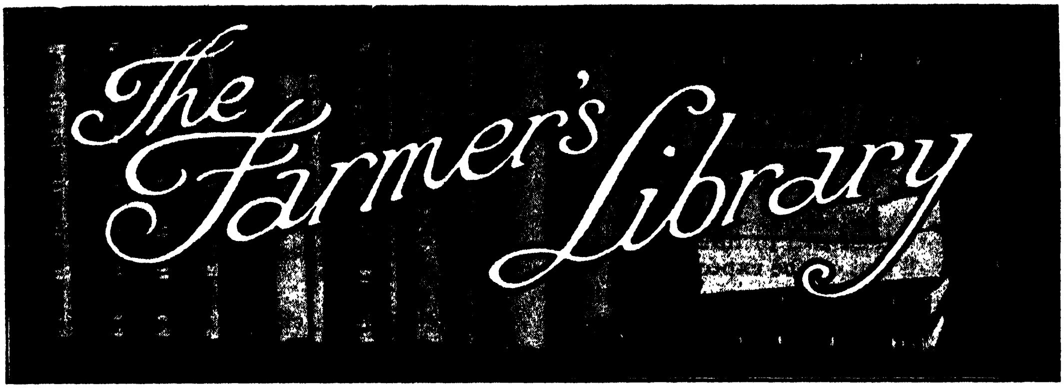


Reviews of Books of Interest to Farmer and Student.

Production and Marketing of Pigs.

BY H. R. DAVIDSON.

IN his preface to this book, the author states that he accepted the responsibility of adding to the already long list of agricultural text-books in the hope that his experience had helped him to co-ordinate the practical and the theoretical approaches to the study of pig production.

There is no doubt that he is well qualified to do so, since for twenty-five years he has taught and examined university students, lectured and demonstrated to farmers, managed pig-herds, built up a herd of pedigreed pigs on his own farm, and carried out a great deal of experimental work. It is this happy combination of practice and theory which will create and sustain the interest of his readers, whether they be students, stud breeders, or commercial pig-farmers.

The author divides his subject into three main sections, the first dealing with general and economic considerations, the second with theoretical and technical questions and the third with practical aspects of management.

The first section, covering five chapters, discusses the economics of the pig industry and, though mainly based on production in Great Britain, is full of interest to the Australian reader. In particular, the chapter dealing with "Pig Price Cycles" has a special significance to us at the moment.

The next fourteen chapters are devoted to detailed discussion of carcase quality, nutrition, breeding and housing. Throughout, one is impressed by the balanced discussion of each aspect so that science is not allowed to outstrip practical limitations.

The last twelve chapters deal with management and here the author displays his wide practical knowledge of the problems which face the pig-raiser from day to day.

This book can be accepted as an outstanding addition to literature dealing with pig production.

Our copy from Longmans, Green & Co. Ltd.

Review by G. D. M. Carse.

Artificial Insemination.

BY GOODE and RUDDUCK.

THIS book is stated to be a translation of the official text book issued by the Department of Agriculture of the U.S.S.R.; translated by J. S. Goode and edited by H. B. Rudduck.

The book is well-produced, describing in detail the whole process of artificial insemination. Every stage in the procedure from the preparation of the equipment to the actual insemination is illustrated in detail. It thus provides an excellent manual for anyone practising the art of artificial insemination In addition to the description of the conduct of the work, reference is made to sire selection, grading up of herds,

and feeding of the sires used in an insemination centre, together with notes on the anatomy and physiology of reproduction.

In the light of our Australian experience, the statement that "some bulls have given two and three ejaculates per day over a long period," is surprising. We have found that not more than two to three collections per week is all that can be expected, and this is in keeping with the opinions of other authorities. The claim made that reduction in sterility can be ensured by the practice of artificial insemination, should be accepted with caution. Certainly when the stock are inseminated by a veterinary surgeon and the animals are carefully examined before insemination, steps can be taken to reduce infertility, but it cannot be claimed that artificial insemination alone has a very marked effect.

The book is recommended as an excellent handbook for perusal by anyone interested in artificial insemination.

Our copy from Angus and Robertson Ltd., Sydney.

Review by W. L. Hindmarsh.

Pregnancy Diagnosis Tests: A Review.

BY ALFRED T. COWIE.

THIS is a valuable addition to the reviews of scientific literature. The author has surveyed all the important papers on the diagnosis of pregnancy with the exception of those concerned with clinical methods in women. The bibliography is very comprehensive and occupies ninety-nine of the 283 pages.

The chapter on clinical methods of pregnancy diagnosis very briefly summarises methods available to the veterinarian. The remaining nine chapters deal with hormonal tests and enzymic and other biochemical tests of body fluids as well as tests based on physiological and immunological phenomena and on physical investigations of body fluids and tissues. The chief value of the book lies in its completeness as a reference work.

Commonwealth Agricultural Bureaux Joint Publication, No. 13, 1948, p. 283. Obtainable from technical bookshops or from Commonwealth Agricultural Bureaux Liaison Officer, 314 Albert-street, East Melbourne, C.2. Price: 18s. 9d.

Farm Machinery and Equipment.

BY H. C. SMITH.

THIS book contains information about farm machines from the first principles of their construction to the very latest methods of their application, and presents it in a very comprehensive manner.

Almost all types of farm machines are illustrated and valuable hints on their adjustments are included. Resistance of various soil types to the draught of ploughs and other implements is fully explained, and the points on the selection of the suitability of farm equipment given should be helpful to farmers when purchasing new machinery.

The book is a sound investment for any man on the land.

Our copy from the publishers, McGraw Hill Book Co. Inc., New York, U.S.A.

Review by L. Judd.

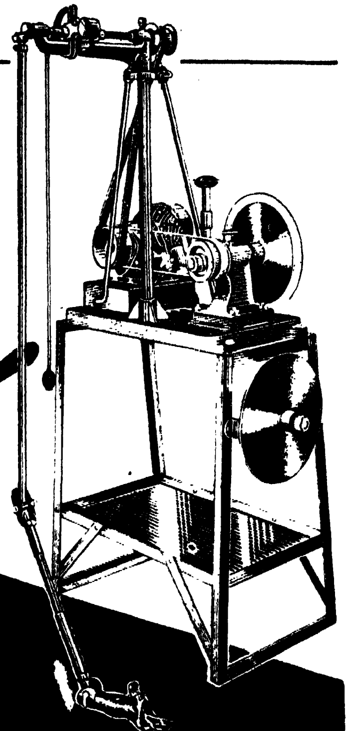
Technique of Breeding for Drought Resistance in Crops.

BY T. ASHTON.

IN this publication, which is Technical Communication No. 14, Commonwealth Bureau of Plant Breeding and Genetics, Cambridge, the important published information relating to the problems of breeding for drought resistance in the principal farm crops is reviewed.

Much of the account is devoted to wheat. Maize, sweet corn, barley, rice and millet are only briefly covered. The important fact is brought out that although water is one of the most important factors limiting the growth of crops, little specific breeding for drought resistance has been done. There is a bibliography of 124 references.

Obtainable from Commonwealth Agricultural Bureaux, Liaison Officer, 314 Albert-street, East Melbourne, C.2, price, 3s. 2d.



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INSECT PESTS.

Notes contributed by the Entomological branch.

APHIDS OR PLANT LICE

(*Aphididae*)

THESE insects, on account of their small size, and often concealed positions on plants, are frequently overlooked until a heavy infestation has developed. Amongst those which commonly attack orchard trees are the green peach aphid, the black peach aphid, the cherry aphid, the citrus aphids, and to a lesser extent the woolly aphid of apple trees. The most prevalent aphids amongst vegetable crops are the green and slaty-grey cabbage aphids, the green tomato aphid, bean aphids, the melon or pumpkin aphid and carrot aphids.

Cultivated ornamental plants and shrubs serve as primary or secondary food-plants of a large number of species of aphids.

Aphids comprise a large group of small, soft-bodied insects which may be found on the undersides of leaves, around flower buds and on the young shoots and bark, or on the roots of various plants; others, again, may live in galls. Some species, by means of special glands, secrete varying amounts of a white, waxy substance which may be either powdery or woolly, and this may cover their bodies. Most species, however, are without any protective covering. They are of various colours, depending upon the species and sometimes upon the food-plant.

Most aphids possess a pair of characteristic tubular processes, known as cornicles, which arise from the fifth segment of the abdomen, but in some species these organs may be reduced or absent. The cornicles secrete a waxy fluid which may, perhaps, protect them from some of their predaceous enemies.

Aphids possess sucking beaks, and feed by puncturing the plant tissues and extracting the sap, and thus, when numerous may cause drying up and curling of the leaves, and distortion of the buds and flowers, and weaken the entire plant. Some aphids cause scars and gall-like swellings to form on the limbs, twigs or roots of the plants. Many are capable of transmitting various plant diseases.

Most species excrete quantities of "honey-dew," a sugary substance which adheres to and disfigures the foliage upon which it falls, and a black or sooty mould, which develops in the "honey-dew," adds further to the disfigurement. Ants and flies are attracted by this secretion and feed upon it. The "honey-dew" of some aphids may cause a "burning" of the foliage upon which it falls.

The adults may be either winged or wingless, and the immature or nymphal forms grow by a series of moults.

Many aphids feed upon a wide range of food-plants, but others prefer either a single species of plant or else closely-related species. When winged forms are developed they may remain on their first food-plant, or fly off to various secondary food-plants, and on these give rise to fresh colonies. From these plants winged individuals, of later generations, may migrate back to the original food-plant during the autumn and early winter.

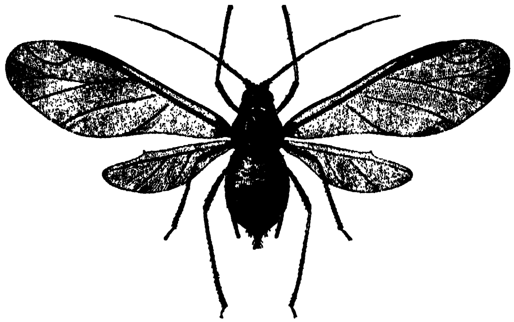
Some aphids during the autumn and early winter lay eggs which overwinter. These eggs hatch in the spring, and a generation of wingless aphids develops. This first spring generation gives birth to living young, and these in their turn produce further living young, so that generation after generation, all the individuals of which are either

winged or wingless females, continues to develop in this manner until the approach of autumn, when wingless egg-laying females, and winged males (or wingless in some species), make their appearance. The females of this generation, after mating, lay the overwintering eggs.

In some species, such as the black peach aphid, all the individuals are females which produce living young.

The Green Peach Aphid (*Myzus persicae*).

In some seasons, this aphid is a serious pest in the peach- and nectarine-growing districts of the State, and, to a lesser extent, in the coastal areas. The main damage occurs during the spring and summer, and where heavy infestations occur, the leaves and blossoms become distorted and shrivelled, and may eventually die.



Winged Female of the Green Peach Aphid.

In the colder districts this aphid deposits its minute overwintering eggs on the peach trees, principally around the bases of the buds, during May to mid-July. The eggs hatch about the end of July or early in August. This generation of aphids remains on the trees, and when the buds burst, commences to produce numbers of living young, and injury to the buds then becomes evident. In the early summer, winged migratory forms develop, and these fly off to various secondary food-plants where they develop throughout the summer. In the late autumn, they migrate back to the peach trees, where the wingless egg-laying females are developed.

The wingless adult aphids vary in colour, from green to pale-yellow, or sometimes pale-pink; the winged adults are mostly green with darker markings.

The Black Peach Aphid (*Anuraphis persicae-niger*).

This aphid is found in most of the peach-growing districts of the State. It infests peaches, nectarines, and sometimes apricots, almonds and plums.

These aphids may be found on the roots throughout the year, but from late December to early March, they are rarely found on the above-ground portions of the trees, as with the arrival of hot conditions migration back to the roots occurs. Only wingless forms have been observed on the roots.

The main damage is caused to the tops of the trees, and lateral growth, which should carry the next season's crop. Infestation of low-borne lateral growth commences in late March or early April, and if the aphids are not checked, shrivelling and curling of this growth, followed by a gradual die-back from the tips, will occur.

The mature aphids, which may be either winged or wingless, are glossy black, and the immature forms brown. This species is not known to lay eggs, and no males are known.

The Cherry Aphid (*Myzus cerasi*).

This aphid causes the terminal shoots of the trees to become dense, sticky masses of twisted leaves. Serious damage is caused to the young, succulent growth on trees which have been cut back or reworked, and young trees may also be seriously injured. On heavily-infested trees the foliage and fruit may become covered with "honey-dew" and sooty mould.

Although the winter is passed mainly in the egg stage, on the trees, about the bases of the buds, small colonies of these aphids, and their developing young, may be found on individual trees during the winter. The presence of such aphids on the trees is usually indicated by a "pinking" and swelling of the infested buds, and premature growth of leaves and blossoms, which subsequently die back.

All stages, including both the wingless egg-laying females and the winged males, develop on the cherry trees. The eggs, which are deposited during May and June, commence to hatch about the end of July, and hatching continues until about the middle of September.

The mature wingless females are glossy black, and the winged forms may be dark brown or black. The immature forms are usually various shades of brown.

Citrus Aphids (*Toxoptera aurantii, Aphis* sp.).

These aphids are present to some extent every year, during the spring and autumn, on the young growth of citrus trees. The period when most injury occurs, in coastal areas, is usually from about mid-September to mid-October, but in some seasons, autumn infestations may also be severe. As the tree growth becomes older and hardens with the approach of hot, dry weather, the aphids diminish in numbers.

Black Citrus Aphids.

Where severe infestations occur during late autumn, the aphids may persist on the trees in small colonies throughout the winter, and thus commence early infestations of the spring growth. Considerable reduction in the setting of fruit on some trees may occur when the aphids are particularly numerous during the blossoming and early fruit-setting periods, and the foliage and fruits may become covered with sooty mould.

In both species, the winged aphids are mostly glossy black, and the wingless forms either glossy black or brownish.

The Woolly Aphid (*Eriosoma lanigerum*).

This aphid infests apple trees, and is to be found on the roots, as well as the above-ground portions. Its presence is usually indicated by masses of white, woolly substance which the aphids secrete. The bodies of the aphids, of both winged and wingless forms, are brown, but become black, or dark bluish-grey, when parasitised, and lose their woolly covering.

These aphids, by feeding on the branches and twigs, and on the roots, cause gnarled, lumpy swellings or galls to form, and in old infestations, may completely distort whole branches.

Cabbage Aphids (*Myzus persicae, Brevicoryne brassicae*).

Two species of aphids commonly attack cabbages, cauliflowers, etc., one species being green and the other slaty-grey and more or less covered with a mealy substance.

The green cabbage aphid, which is identical with the green peach aphid, is mostly found beneath the leaves, but may infest all parts of the plants.

The slaty-grey cabbage aphid also infests various other crops and garden plants related to the cabbage. These aphids occur in masses on the leaves, but all parts of the plants, including the flower stalks and buds, may be severely infested.

The Green Tomato Aphid (*Macrosiphum solanifolii*).

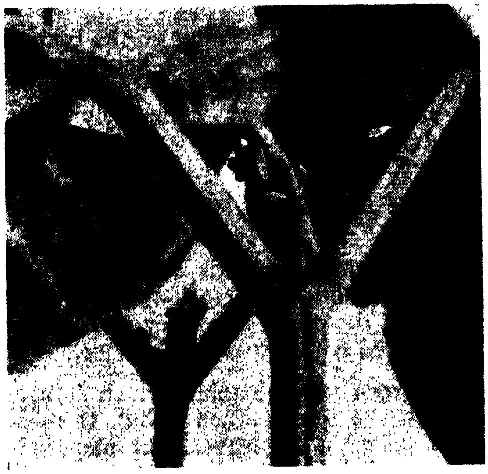
The large green aphids which attack tomatoes are mainly pests of spring and autumn crops. They have a wide range of food-plants, and are frequently numerous on the flower-stalks of sow thistles, tender shoots and buds of roses, cineraria, gladiolus, potatoes and other plants.

Bean Aphids (*Aphis* spp.).

During the spring, French beans are subject to heavy aphid infestations, which may cause serious damage, especially in dry weather. Young plants may be attacked soon after they appear above ground. On older plants the undersides of the leaves become infested, and all parts of the young growth may be covered.

Broad beans are very liable to aphid attack, and the young growth, flower buds and forming pods, may become stunted and deformed.

The aphids most frequently found on beans are small, dark brown or black species. Winged aphids migrate to the plants first, and these produce living young which become wingless females.



Aphids on Young Bean Shoots.

The Melon or Pumpkin Aphid (*Aphis gossypii*).

This aphid infests melons, pumpkins, cucumbers and related plants and also a wide variety of other plants including cosmos, dahlia, hibiscus, sunflower, thistle, etc.

It is a small species, and is of very variable colouration. Individuals in the same colony may be yellow, yellowish-green to dark-green, or almost black.

Carrot Aphids (*Cavariella* spp.).

The foliage of carrots, at times, becomes severely infested with aphids. They feed mainly on the undersides of the leaves, and when numerous, the foliage curls and dries up, and becomes covered with "honey-dew."

The winged forms of this small aphid are green, and the wingless forms usually yellowish.

Aphids on Cultivated Ornamental Plants.

Many varieties of ornamental garden plants serve as primary, or secondary, food-plants for a number of species of aphids, and more than one species may be found feeding in association in the same colony.

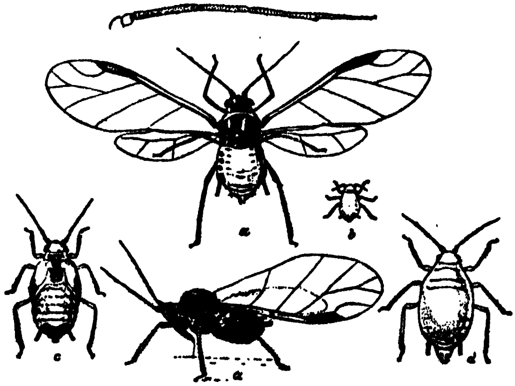
Five or more species may be found infesting roses, viz., the true rose aphid (*Macrosiphum rosae*), which has both pink and green varieties, the tomato aphid, the green peach aphid, and several other small, pale greenish species. Four or five species may also be found on an individual chrysanthemum plant, probably the most injurious species of which is a glossy reddish-brown aphid (*Macrosiphum sanborni*), which often deforms the flower buds.

The pine aphid (*Cinara thujafolia*), in some seasons, heavily infests ornamental pines including *Cupressus, Callitris* and *Thuja,* and also at times infests large areas of *Callitris* in the western pine forests of the State. It is a large, dark brown, hairy aphid that is most numerous during August and September.

Subterranean or Root-feeding Aphids.

In addition to the black peach aphid, and the woolly aphid of apple trees, which attack the roots of the trees as well as the upper portions, there are other aphids which feed upon the roots of various vegetables and herbaceous plants, including weeds, and grasses.

Where the roots of beans, spinach, carrots, etc., are infested, the plants become stunted in growth, the leaves turn yellow and may eventually die.



Various Forms of the Melon or Pumpkin Aphid.
[*After Chittenden.*

Most of these underground aphids have rather globular bodies, and are covered with a white, mealy or waxy secretion which prevents them becoming wet. They are frequently attended by ants, which may assist

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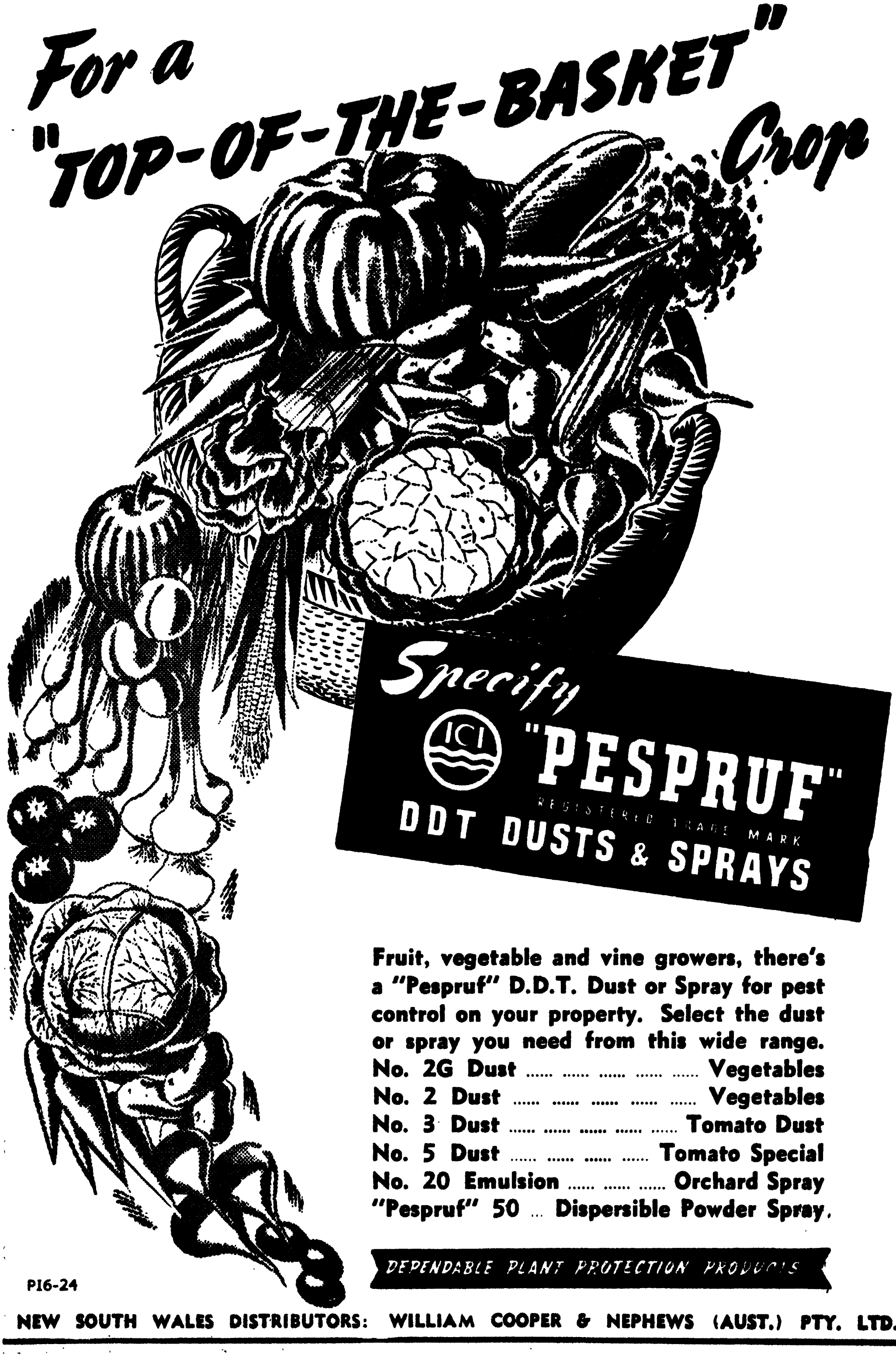

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in their spread, as they construct galleries along or amongst the roots of the plants, thus allowing the aphids easy access to fresh feeding-places.

Control Measures.

Green Peach Aphid.

Dormant Sprays.—DNC-oil 1 in 40 or tar distillate 1 in 40. These sprays should only be applied when the trees are fully dormant, usually during the latter half of July. The DNC-oil spray is preferable where San José and prune scales occur, as this spray, in addition to destroying the aphid eggs, also controls these scales.

Semi-dormant Spray.—DDT in semi-dormant oil 1 in 40. This spray is applied after the eggs have hatched, and before the buds burst in the spring.

Spring and Summer Sprays.—DDT 0.1 per cent. (DDT emulsion 20 per cent. 4 fluid oz., water 5 gallons, or 1 pint to 25 gallons). This DDT spray may be mixed with Bordeaux, or lime-sulphur, where either of these is necessary to control diseases. Water dispersible powder forms of DDT have not given generally satisfactory results.

HETP 1 in 1,600 (½ pint to 100 gallons), plus a neutral spreader, is effective at cool as well as fairly high temperatures. This spray is a satisfactory substitute for nicotine sulphate, but it is not compatible with alkaline chemicals such as Bordeaux mixture, lime-sulphur, lime-casein spreaders, etc., and must be mixed in a clean spray vat. It breaks down quickly when mixed with water.

Nicotine sulphate (40 per cent.) 1 fluid oz., soap 2 oz., water 4 gallons (1 pint to 75 gallons plus 3 lb. soap).

Black Peach Aphid.

Dormant and semi-dormant sprays will control aphids present on the trees at the time of spraying, but will not prevent re-infestation by forms migrating from the roots.

DDT emulsion, 0.1 per cent., applied at late bud-swell (about late August) will control the spring brood, and keep the trees free from aphids during the important September-October period.

The roots of infested nursery stocks may be immersed in, or thoroughly sprayed with a nicotine-soap solution, the formula for which is given above (*see* green peach aphid). Where replanting of aphid-infested land is contemplated, the roots of old trees should be removed. The new trees should not be planted in the old holes.

Cherry Aphid.

DNC-oil, and tar distillate sprays, as given above for the green peach aphid, may be used while the trees are completely dormant. After the eggs have hatched, and before the buds burst, from about the middle to the end of September, the DDT in semi-dormant oil may be used.

Nicotine sulphate and soap solution, and DDT emulsion sprays may be used for later treatment. These sprays are usually applied during the "shuckfall" or "sepalfall" stage, generally towards the end of October, and where DDT is used, control of the cherry slug (*Caliroa limacina*), will also be obtained. DDT emulsion is compatible with Bordeaux mixture and lime-sulphur.

At times, a further application of spray becomes necessary, but DDT should not be used later than three weeks before the fruit is harvested.

The removal or treatment of infested suckers is also recommended.

Citrus Aphids.

Nicotine and soap solution, at a concentration of: Nicotine sulphate (40 per cent.) 1 fluid oz., soft soap 4 oz. (or white oil emulsion ½ fl. oz.), water 5 gallons; (nicotine sulphate 1 pint, soft soap 5 lb., or white oil emulsion ½ gallon, water 100 gallons).

In areas where it is necessary, also, to control diseases, the following combined spray is sometimes used: Nicotine sulphate 1 pint, white oil emulsion ½ gallon, bluestone 2½ lb., hydrated lime 2½ lb., water to make 100 gallons.

Another combined spray consists of: Nicotine sulphate ¾ pint, lime-sulphur 1 gallon, casein-lime spreader 1 lb., water to make 100 gallons.

DDT emulsion 0.05 per cent., or HETP 1 in 1,600 may also be used. The DDT is compatible with Bordeaux mixture, lime-sulphur and white oil, but the HETP is not, and must be used alone or with neutral spreaders.

The Woolly Aphid.

This aphid is usually controlled by the introduced wasp parasite (*Aphelinus mali*), which is well established throughout the State.

Winter Treatment.—Miscible red oil 1 in 20. This spray is best applied as late as possible before the buds commence to swell. The application of red oil at this time will also control San José Scale.

Spring Treatment.—Nicotine sulphate 1 fluid oz., soap 2 oz. (or white oil emulsion 6½ fluid oz.), water 4 gallons (1 pint to 75 gallons plus 3 lb. soap, or ¾ gallon white oil).

If arsenate of lead is being applied for codling moth control, it may be combined with the nicotine, and with a fungicide also, if necessary, but lime-casein, 1 lb. to 75 gallons, should be used as a spreader. Soap should not be mixed with any sprays containing lime-sulphur, Bordeaux mixture or arsenate of lead.

Where DDT is being used to control codling moth, it is advisable to confine the use of this insecticide to the early part of the season, so that surviving parasites can multiply sufficiently, during January and February, to ensure reasonably effective control of the aphids during the autumn months.

Cabbage Aphids.

Use nicotine dust 5 per cent.; nicotine sulphate and soap solution, as given above for the woolly aphid; HETP 1 in 2,000 (1 fluid oz. to 12½ gal. water), or DDT emulsion 0.1 per cent. (4 fluid oz. of 20 per cent. emulsion to 5 gallons), or 2 per cent. DDT dust. Treat seed-beds before planting out, and field crops as soon as small colonies of aphids are noticed.

Treatment of cabbages with DDT must cease about four weeks before cutting, and cauliflowers must not be treated after the curd commences to form.

Tomato Aphids.

Where DDT sprays or dusts are used for control of tomato caterpillars, the aphids will also be controlled. Nicotine sulphate solutions may also be used.

Bean Aphids.

Use nicotine sulphate 1 fluid oz., plus white oil emulsion 6½ fluid oz., water 4 gallons; or DDT emulsion, 0.1 per cent., as soon as the aphids appear. More than one application may be necessary.

Melon or Pumpkin Aphids.

On plants such as melons, cucumbers, etc., use nicotine plus oil, as given above for bean aphids, or HETP 1 in 2,000. DDT sprays or dusts are injurious to pumpkins, melons, and related vine crops, but may be used to control this aphid where other plants are infested.

Carrot Aphids.

Use 0.1 per cent. DDT emulsion or HETP 1 in 2,000. Spray undersurfaces of leaves thoroughly.

Aphids on Ornamental Plants.

On most garden plants control may be obtained by using DDT sprays (0.1 per cent.) and dusts (2 per cent.), nicotine sulphate and soap solutions, and nicotine dusts (2½ per cent.).

There is no ready means of controlling aphids that are feeding underground.

Supplies of Certified Bean Seed

SEVERAL hundred bushels of certified seed of each of the bean varieties Tweed Wonder and Wellington Wonder should be available for green bean growers, but supplies of the three stringless varieties, Landreth, New Zealand Stringless Green Pod and Refugee No. 5, will be limited.

Small crops of the varieties Windsor Longpod, Canadian Wonder, New Beauty and Wellington Wonder were also approved as up to certification standard. It is hoped that supplies of certified seed of the new variety Windsor Longpod will be available for green bean growers at the end of the 1949-50 season.

MALIGNANT OEDEMA IN SHEEP

H. G. BELSCHNER, D.V.Sc., H.D.A.,
Deputy Chief, Division of Animal Industry.

MALIGNANT oedema is an acute, infectious disease caused by a wound becoming infected with a germ of the gas gangrene group, and is characterised by a high fever and death in 36 to 48 hours. In sheep it usually occurs after shearing or lamb marking, and is commonly known as "blood poisoning." This germ is widely distributed, but is more commonly found in dirty shearing sheds, old sheep yards, stockyards and cultivated ground. All animals, including man, are susceptible to infection; the sheep is readily infected.

The Cause.

The disease is produced only by the germ gaining entrance to a wound suitable for its growth, as it will not multiply or grow in the presence of oxygen or fresh air. Any injuries which exclude air, such as deep puncture wounds or cuts covered by a flap of skin, are particularly liable to become infected, especially if they occur in contaminated surroundings such as dirty shearing sheds or yards.

The organisms are also to be found in the intestines of horses, cattle and sheep and may be obtained from their faeces. They may be ingested by animals when feeding, and live and multiply in the bowels without causing any ill-effects. They are later passed out in the droppings and subsequently form spores which are very resistant to adverse conditions. In the form of spores the germs live in the dust and filth, and later may be carried to a wound with the dust, and so cause infection. If the wound is favourable for their development, the spores grow into fully-developed germs, multiply and produce a toxin or poison, which eventually passes into the bloodstream and causes the typical symptoms and ultimately the death of the animal.

Symptoms.

The symptoms of this disease in sheep are not usually observed by the owner. Generally, the first indication of any trouble is the discovery of dead sheep scattered around the paddock, about two days after they have been shorn or marked. Usually deaths continue for three or four days and the disease then ceases.

In the early stages, the animal appears listless and disinclined to move about; there is a high temperature, up to 106 or 107 deg. Fahr.; breathing is accelerated; and if the animal is forced to move, the hind legs are drawn forward with a peculiar stiff, dragging action.

A soft, doughy and painful swelling develops around the infected wound, which may be anywhere on the body, and spreads beneath the skin. Frequently gas is formed, and the swelling will later crackle when pressed. The swellings may extend to the more pendant parts along the belly and chest and down the thighs, and become dark-red in colour. If the wound is opened, a foul-smelling liquid and frothy discharge are seen.

The sheep soon goes down and lies on the ground in a state of sheer exhaustion. Death usually occurs within forty-eight hours from time of infection.

Treatment.

Treatment of this condition in the past has been practically useless, with most cases proving fatal. Penicillin has been used with success in the treatment of gas gangrene, and this drug may be of use in the treatment of valuable stud animals affected with this disease, combined with cutting freely into the swelling and applying hydrogen peroxide (one part in three parts of water), or carbolic acid solution (5 per cent).

Methods of Prevention.

Preventive measures are the only satisfactory means of controlling this disease. They can best be applied by taking all possible precautions at shearing time and during lamb-marking.

The shearing shed should be cleaned out thoroughly by setting the machines in motion, sweeping the floor, roof and rafters

and then washing out with a solution of washing soda and carbolic sheep dip or other disinfectant. The chutes and counting out pens should receive special attention, the former being scrubbed with the disinfectant solution.

If the counting out and branding pens are very dirty, or if losses have occurred, the surface soil should be removed to a depth of 6 inches and quicklime spread over the area. Clean sand could be used to replace the removed surface soil, and the fences sprayed with an antiseptic solution. After branding, the sheep should be returned to their paddocks as soon as possible to get them away from the usually contaminated surroundings of the shearing shed.

The remaining yards should also be cleaned up and watered, if possible, to keep down the dust and subsequent risk of infection.

The hand-pieces of shearing machines should be sterilized before shearing commences.

Before lamb-marking commences, all knives and instruments should be boiled thoroughly, and an antiseptic solution prepared and kept handy in the yards so that the instruments may be immersed from time to time. Lambs should not be marked in old yards, but preferably in temporary yards erected each year in new positions by means of a roll of netting and a few posts.

As a general rule no dressing is recommended for application to lamb-marking wounds. If the work has been carried out under clean conditions and the lambs dropped on the fresh pasture after marking, the wounds heal quicker and better without dressing, and infection is not likely to occur. It is not reasonable to expect that a lamb-marking wound may be infected with a dirty instrument or by other means, and then sterilized by the use of some antiseptic dressing. The application of some blowfly repellant dressing to the wool above the wound may be necessary if the fly is active.

Finally all carcases of animals which have died from malignant oedema should be burnt, if possible, to prevent further infection of the soil.

Export of Stock to Victoria.

New Regulations.

OWING to the danger of introducing contagious pleuro-pneumonia, the Victorian authorities have for a number of years prohibited the introduction of Queensland and Northern Territory cattle for fattening purposes to Victoria, unless they have been in New South Wales for a period of ninety days, on the assumption that should any animals be affected with this disease, the symptoms would manifest themselves during this period.

Recently, however, pleuro-pneumonia was diagnosed in two mobs of Queensland cattle which had been introduced into Victoria under these conditions, and it was necessary for a large number of properties to be quarantined in order to effect control and eventual eradication.

These outbreaks indicated that the 90-day period was not sufficient to ensure maximum safety, and advice has now been received from the Chief Veterinary Inspector, Department of Agriculture, Victoria, to the effect that the Victorian Government has amended the regulation under the Stock Diseases Act relating to the introduction of cattle to Victoria. Queensland and Northern Territory store cattle may not now be introduced into that State unless they have been in New South Wales for a full period of 180 days.

The conditions relating to the introduction of fat cattle for slaughter within fourteen days, however, remain unaltered and such stock will be admitted after spending thirty days in New South Wales.

Anthrax Mortalities in Sheep at Bourke.

FOLLOWING investigation by the Stock Inspector at Bourke into mortality in sheep in that district, the Glenfield Veterinary Research Station has diagnosed the deaths to have been caused by anthrax.

The exact number of sheep which died from the disease is not known, owing to the fact that odd animals had been dying for some little time.

Steps were taken to burn all carcases and arrangements made to vaccinate the sheep.

This is the first time serious mortality has occurred on the property in question during the past thirty years.

WOLSELEY

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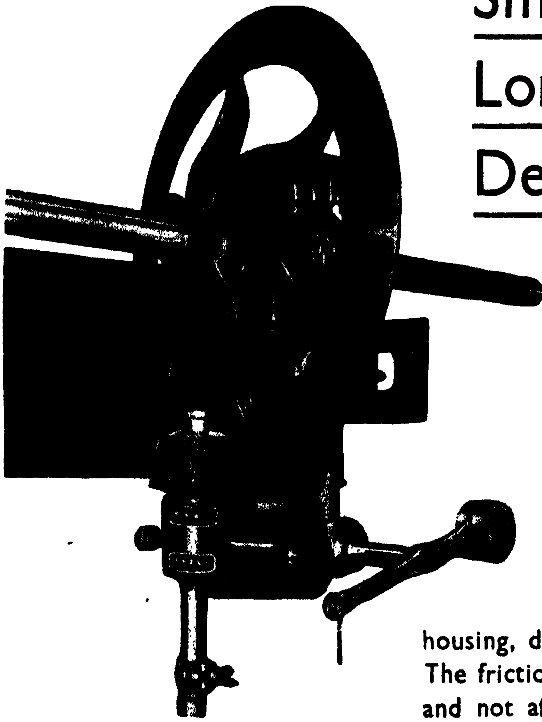

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Dunlop Linked-Bars (with up to 40 lbs. more rubber per tyre) form a continuous chain of support around the whole of the tread — provide a tremendously strong backbone which supports the entire casing — long life factors which ensure Dunlop Linked-Bar Tractor Tyres *outlasting* all others.

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Wintering on a Sunny Hillside.

APIARY NOTES

DANGER OF DYSENTERY

When Working Winter Flows in Damp Weather

W. A. GOODACRE, Principal Livestock Officer (Apiculture).

THE damp conditions which prevailed during the late autumn and continued through June of this year did not give the bees in the large number of hives which had been migrated to the South Coast of New South Wales, an opportunity to store any worthwhile quantity of honey from the Spotted Gum (Eucalyptus maculata) on which a good flowering was present. However, as the majority of migratory bee-farmers had already secured record crops of honey earlier in the season, they will mainly be concerned now about any possible adverse affect the damp weather will have on the health of their bees during the remaining winter period, and during early spring.

With favourable winter conditions on the South Coast, colonies of bees have, in past years, stored honey freely from Spotted Gum, and at the same time, maintained a virile force of young bees which came through to settled spring weather in good condition. It was, of course, necessary that well drained and sunny sites be selected for the temporary establishment of apiaries in order to guard against damp, unhealthy conditions, such as would be predisposing causes of the dysentery and dwindling troubles of the adult bees.

Importance of Uncontaminated Food.

A study of the habits of worker bees will explain the reason why they may become susceptible to dysentery under certain conditions. In the first place we note that the normal way in which bees dispose of faeces is during cleansing flights in the air. Bees will not pass faeces within their hive; if cleansing flights are impossible, bees crawl outside and perish, rather than contaminate their living quarters.

Where the food supply is normal, bees may hold faecal matter in their bodies for quite lengthy periods without injury.

However, when bees are required to deal with a deteriorated food supply—as when working a winter honey flow during damp weather—cleansing flights are needed rather frequently to clear the toxic matter from their digestive organs.

Effects of Damp Weather on Pollen and New Honey.

Newly stored honey is liable to deteriorate during damp weather because the bees are unable to reduce its high moisture content sufficiently when the air is saturated with moisture. As a result, some fermentation takes place. In addition to the new honey stores being affected, the pollen supply may also be contaminated.

Under the mild climatic conditions with ample sunshine experienced in Australia, colonies of bees are rarely affected with dysentery during the warm months of the year, but it may become very serious and cause heavy mortality in the adult working force when continued, or even intermittent, damp conditions prevail during the working of an autumn or winter honey flow.

Overseas Methods of Wintering.

In some overseas countries where severe, cold winter conditions prevail, hives of bees require special protective covering, or to be placed in cellars, and under these conditions the quality of the food supplies is all important. If suitable food is supplied,

There is Risk in Working a Winter Honey Flow.

All that was left of seventy-five hives.

clustered and semi-hibernating colonies will come through in good health, even though they are confined to the hive for a lengthy period. However, heavy mortality will occur if the food supply is not in good condition for wintering purposes.

The preparation of the cellar or the protective covering of hives on an outside site, must be properly attended to, to preserve the health of the bees, and minimise risk of deterioration of stores held in the hives. Any neglect in respect to these matters is likely to result in heavy losses from dysentery.

The point is that in cold winter climates, little, if any, brood-rearing is carried on, and the colonies forced into a semi-hibernating state consume only a bare minimum of food.

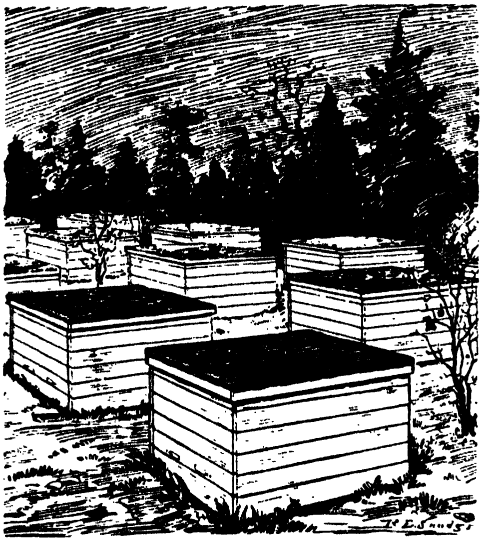
These conditions are very different to those obtaining in colonies working a winter honey flow in Australia under trying damp

Under such circumstances trouble from dysentery is likely to develop, even when intermittent sunny days occur during the winter period. However, the most distressing symptoms arise if inclement weather forces affected bees to remain indoors for any length of time with toxic faecal matter retained in their bodies.

Symptoms of Dysentery.

The first indication of trouble from dysentery is the appearance of a number of dead and sick bees, usually with their abdomens distended, about the entrances to the hives. Spotting of the environment of the hive with excrement the colour of which may be yellow or dark-yellow, will also be noted. In severe attacks beekeepers may observe a little spotting inside the hives, but this results from the disturbance of sick bees when the hive is opened for inspection.

conditions. Often brood-rearing is fairly well advanced and house bees are called upon to consume an additional quantity of food to provide chyle for young bee-larvae. It is obvious that if stores have deteriorated under these conditions trouble from dysentery or other digestive ailments will be intensified.



Four-colony Cases in which Hives are Packed for Winter in U.S.A.

Observation of the Behaviour of Imported Bees.

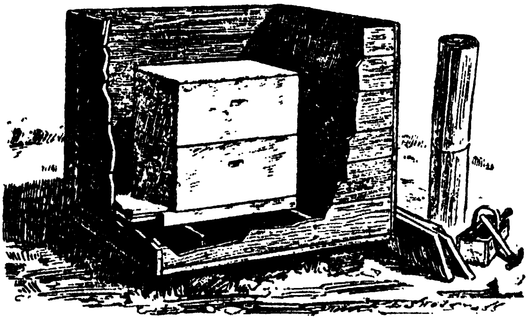
Close observation of the condition and actions of escort worker bees imported into Australia from overseas countries, when their transport cages are opened up at the Department for quarantine examination, gives an indication of the hardship bees will undergo rather than pass faeces in the cage in which they and a queen have been confined under unnatural conditions for a fairly lengthy time.

The queen is not affected, but the abdomens of her escort workers are often distended almost to bursting point. Should any of these bees escape into the large glass-sided case used during the process of opening the imported cages, they almost invariably relieve themselves of congested faecal matter whilst attempting to crawl up the glass sides of the case. This indicates that the faeces can be expelled by the distended bees when not actually flying in the air. In these instances the bees are not affected with dysentery, but rather by distension from holding natural faecal matter rather than contaminate the transport cages.

The specially prepared candy food in the export cages is of a high quality; if it were not dysentery would develop because of toxic matter being held in the digestive tract of the bees, and they would not survive the journey. The extreme conditions of the past have been relieved in recent years by the development of airmail service from overseas. Now it is only a matter of a few days generally for imported bees to get through, and little if any suffering on account of distension occurs.

These interesting observations in relation to imported bees emphasise that bees can hold faecal matter for a lengthy period, even under unnatural circumstances, if the food supply is not contaminated. Under Australian conditions the time can be quite lengthy without undue stress if the food supply is not contaminated—long enough to await the fine day or two that would surely occur and allow of cleansing flights being made.

It is obvious that the main reason for serious mortality from dysentery is the holding of toxic faecal matter in the bodies of the bees when they have to deal with a deteriorated food supply.



An Improvised Case used to Pack One Colony in U.S.A.

Treat Dysentery by Changing Environment.

No medicinal treatment is helpful in overcoming dysentery. Treatment consists of moving the bees away from an environment where predisposing causes of this ailment prevail. Maybe the actual apiary site is not a healthy one, and the removal of the hives to a higher, sunny position will be sufficient. Inquiry amoungst other beekeepers about

the locality concerning the condition of their colonies will be a helpful guide in this direction. Where apiaries generally about the district are affected, the safest plan is to move the hives away from species of flora from which new honey is gathered.

Migratory bee-farmers often take the risk of leaving bees on selected sites and depending on a change to favourable weather conditions enabling the colonies to recover. This occurs at times, but too often either the colonies come into spring in a very weak condition, or rather heavy losses occur.

It is found occasionally that several feeds of warm sugar syrup given inside the hive as a change of food will prove helpful. This is particularly the case when affected colonies are moved away from the winter flow to a place where the bees can rest and recuperate.

Registration of Apiaries.

ALTHOUGH the majority of beekeepers have registered their apiaries for the registration year which commenced on 31st March last, many have not yet done so. Forms for the purpose were forwarded to beekeepers who registered during the previous year and from whom no advice had been received to indicate that they had discontinued beekeeping.

Every beekeeper is required to register with the department within fourteen days after commencing to keep bees, and thereafter to register on 31st March each year. The fees payable, according to the number of hives kept, are as follows:—

1 to 5 hives—2s.
6 to 20 hives—4s.
21 to 50 hives—7s.
Over 50 hives—10s.

The Bee Diseases Compensation Scheme administered by the Department to provide financial relief to beekeepers who suffer loss as the result of the destruction of diseased bee materials in accordanc with orders issued under the Act, is financed from the apiary registration fees.

Defects in Dairy Utensils.

Value of Knowledge of Soldering.

No farmer has to use tinware of various descriptions to the same extent as the dairyman, and an elementary knowledge of the use of the soldering iron is of particular value in his case. In fact, this knowledge might almost be considered a necessary part of a dairy farmer's training.

The mending of leaks, retinning of rust spots, refixing of milkcan hoops, etc., are all jobs possible by a man determined to master a few essentials of the process.

It is the continuous neglect of rough places in tinware that has such a serious effect on milk and cream quality, by affording lodging places for decaying milk and cream. The exposed metal is also attacked by the acid in the cream, and this is responsible for some of the flavour defects in butter. A few drops of solder will quickly rectify these tinware faults.

The process of soldering, with particular reference to its use on a dairy farm, is the subject of a leaflet which may be obtained free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

Importance of Orchard Sanitation in Disease and Pest Control.

MANY growers are content to depend on spraying alone in their battle with the various fruit diseases and pests, but in many instances orchard sanitation measures designed to prevent spread or carry-over from one season to another of fungous spores or insects play a very large part in effective control.

In the case of powdery mildew of apples, cutting out and destruction of as much as possible of the infected terminals and buds during pruning is equally as important in effective control as seasonal spraying with sulphur sprays. Similarly, removal and destruction of "mummies" and burning of prunings is an important part of the programme for control of brown rot of stone fruits, and removal of infected leaves and canes of passion vines is a necessary measure in the combat of brown spot.

In all these cases the aim is to supplement the preventive effect of spraying by reducing to minimum the "pockets" of infection or infestation.—DIVISION OF HORTICULTURE.

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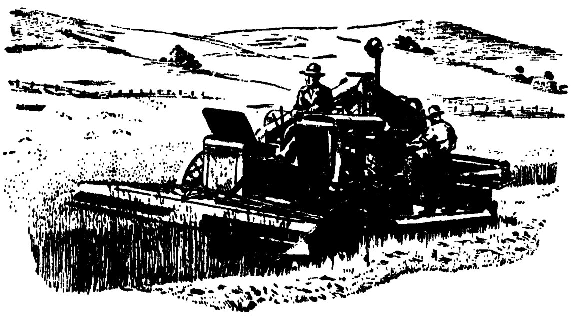

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Poultry Notes

E. HADLINGTON, Principal Livestock Officer (Poultry).

EGG PRODUCTION COSTS, 1948-49

FOLLOWING upon the publication of the comprehensive report of the Federal Bureau of Economics on the survey of the cost of producing eggs throughout the Commonwealth, it will be of interest to producers to compare the results with the estimated cost on the basis adopted in these Notes during the past few years—that is, a farm carrying 1,000 hens laying an average of 12 dozen eggs per bird on which half the hens are replaced each year.

The figures, revised to bring them into line with increased costs, are given in the accompanying table.

ESTIMATED COSTS FOR YEAR 1948-49.

	£	s.	d.
Interest on land (5 acres at £60 per acre), at 5 per cent.	15	0	0
Interest on buildings and plant (£800), at 5 per cent.	40	0	0
Depreciation on buildings and plant (£800), at 3 per cent.	24	0	0
Maintenance costs ..	25	0	0
Cost of feeding 1,000 layers at 13s. 9d. ..	687	0	0
Purchase of 750 pullet chicks at £8 per 100	60	0	0
Municipal or shire rates, water rates and excess water	30	0	0
Incidental expenses, vaccination, etc. ..	20	0	0
Labour allowance ..	413	0	0
Marketing costs (freight or cartage, control fund, deductions, handling charges) ..	181	5	0
Cost of producing 12,000 doz. eggs	£1,495	5	0
Cost per dozen	0	2	5·9

The cost of approximately 2s. 6d. per dozen compared with the average gross price paid by the Egg Marketing Board for all grades of eggs, viz., 2s. 2.17d., shows a loss of nearly 4d. per dozen. This does not take into account the return from the Pool Finance Fund, which amounts to about ¾d. per dozen on the year's production; allowing for this would reduce the loss to 3¼d. per dozen.

Last year's figures showed a loss of 3¾d. per dozen.

Comments on the Figures.

The figures this year show that where poultry farming is carried on under these conditions the net return would be £250 10s. This is arrived at by deducting 3¼d. loss on 12,000 dozen eggs, which amounts to £162 10s., from the £413 allowed for labour.

Last year's comparable figure was £225.

The average gross price paid by the Board is the price paid to those consigning eggs to the Board floors; thus anyone selling a large proportion of eggs under a Producer Agency permit would show a somewhat higher average price, while those who secure a higher average production than 12 dozen per bird per year would earn a higher income. On the other hand, any lower average production would result in a smaller return.

The cost of feeding during the year just concluded shows an increase of 2s. per bird compared with last year, while the average gross price paid for eggs is 2.42d. per dozen higher, or allowing for the ¾d. per dozen from the Pool Finance Scheme—3.17d.

It will be noted that no allowance is made for feeding the season's chickens to productive age, but it is considered that under present conditions this cost would be covered by the sale of hens each year.

HANDLING TABLE BIRDS IN OTHER STATES

DURING a visit to Perth to attend the Annual Meeting of the Egg Producers' Society, the opportunity was taken to look into table poultry operations in Perth and Melbourne. In Perth the two main establishments which handle the major portion of the dressed poultry for that city, namely, the Poultry Growers' Co-operative Society, at Welshpool, and G. Gordon, poulterer, of Nedlands, were inspected, and at Melbourne a visit was paid to the plant of the United Poultry Farmers' Co-operative Society Ltd.

W.A. Poultry Growers' Co-operative Society's Plant.

This Society's plant has an area of 3 acres. Operations were commenced four years ago on a modest scale, but now the plant handles approximately 2,500 birds per day. In 1948 exports totalled 237,332 birds valued at £110,000.

The number of shareholders, which in 1946 was 110, has increased to 1,400 in 1949. The profits have grown from nil in 1946 to £9,452 in 1948.

A freezing plant has been installed comprising one 15 ton compressor and another 7½ ton compressor, and the freezing chambers have a total capacity of 4,000 birds for chilling and freezing.

At the present time the birds are held in pens 50 ft. x 6 ft. for thirty-six hours prior to killing. Each pen holds 130 to 140 birds, but batteries of coops consisting of three compartments each are being constructed for holding the birds. It is proposed to make thirty-two of these units, the dimensions of each coop being 6 ft. x 3 ft. x 1 ft. 6 in. high. These will hold twenty birds and will give a total capacity of approximately 2,000 birds. The coops are made of mesh wire and fitted with dropping trays and castors.

The Society supplies crates on hire for bringing the birds into the depot, the charges being 9d. per crate in the metropolitan area, and 1s. per crate for country consignments.

The birds are weighed in the coops as they are brought in and the consignor is paid on a weight basis.

Killing Operations.

The procedure adopted for killing the birds is to place them in funnel-shaped cones, made of galvanised iron, approximately 10 inches wide at the top and 4 inches at the bottom and 14 inches long. The cones prevent flapping of the wings when the birds are killed. The heads of the birds project from the 4-inch opening at the bottom end, enabling the throats to be cut and the necks dislocated.

The cones are fitted in a circular iron frame, eight to the set, which is used at the beginning of the killing chain. Larger cones are used for turkeys and ducks; only six of these are used to a set.

Plucking Birds on the Chain System.

[*Photo. by courtesy of the United Poultry Farmers' Co-operative Society, Melbourne.*

After killing, the birds are held, by hand, in the scalding tank with the water at a temperature of 128 to 130 deg. Fahr. for 30 to 45 seconds according to age and are then hung on wire hangers for plucking. They are then placed on a chain carrier and conveyed to the inspection room. After being graded for export and local trade, the heads are wrapped in greaseproof paper and the birds hung on racks for transfer to the freezing chamber.

An up-to-date chain killing plant, on the lines of one of the leading plants in New South Wales, is now being installed.

Gordon's Poultry Killing Establishment, Nedlands, W.A.

This poultry killing and dressing plant handles about 1,000 birds per day.

Killing is carried out in much the same way as by the Co-operative Society and the birds are semi-scalded. Plucking is carried out mainly by women.

Packing Birds for Export.

[Photo. by courtesy of the United Poultry Farmers' Co-operative Society, Melbourne.

Dressing Ducks.

Ducks, after being killed in the cones, are bled for a minute or so and then placed in cold water which is agitated to wet the feathers thoroughly. They are then held by the legs in the scalding tank, care being taken that the shanks are not immersed in the water, as this would cause them to peel. The temperature of the water is 138 to 140 deg. Fahr. and the birds are immersed for ¾ to 1½ minutes according to age. The birds are then placed in a cold water bath, where they are plucked, and afterwards are transferred to a 200 gallon tank of cold water where they remain for 30 minutes. They pass from this tank to another 200 gallon tank in which 3 cwt. of ice has been placed, and they are kept in this tank for half an hour before being placed on racks to drain and transferred to the freezer.

It is found that this method of handling ducks prevents the skin becoming blemished or dried out by scalding.

Well appointed freezing and chilling chambers are established on the premises, and both export and local trade are catered for.

The prices paid for live poultry by both the Co-operative Society and Gordon's compare favourably with those ruling in this State.

United Poultry Farmers' Co-operative Society Ltd., Melbourne.

When passing through Melbourne the opportunity was taken, through the courtesy of the Poultry Expert (Mr. M. D. Hall) of the Victorian Department of Agriculture, to make an inspection of the extensive plant of the United Poultry Farmers' Co-operative Society Ltd. which has been established for the killing and dressing of poultry. A general co-operative organisation is conducted for the supply of various poultry requisites and household requirements to poultry farmers.

The poultry killing and dressing establishment is most up-to-date and fitted with a chain killing, semi-scalding unit, also freezing and chilling chambers.

In addition to catering for the normal export and local trade, a new development is the marketing of pressed chicken. The birds are cooked and the flesh pressed into moulds similar to those used for pressing ham, the product being sold for about 4s. per lb. In this way birds which are badly torn or otherwise unsuitable for sale in the ordinary way, are utilised.

Successful Co-operatives.

The producers in Perth and Melbourne must be congratulated upon their enterprise in the establishment of co-operative organisations, and the success met with should be an incentive to our producers to support the co-operative table poultry organisation which is now being inaugurated.

Pullorum-tested Flock Scheme.

THE Pullorum-tested Flock Scheme officially came into operation on 1st June, 1949. On that date, agreement forms began to go out to various poultry farmer bodies and to the veterinary surgeons doing the bulk of the testing.

Interest in the Scheme has been very great, the large hatcheryman, the egg producer and the backyard poultryman, all being equally involved and interested. Country people await publication of the list, as indicating the names of hatcheries where chicks from pullorum-tested stock may be obtained.

To date no names have been listed, but the list of hatcheries under the Scheme will be published regularly in future issues of the *Agricultural Gazette*.

Danger from Careless Washing of Spray Tanks.

WHILE most growers realise that certain chemicals used as insecticides and fungicides cannot be used safely in combination, some do not realise the importance of thoroughly emptying and cleaning out spray tanks after use. Such growers may either only incompletely clean the tanks or carelessly leave them unwashed.

This may lead to chemical reaction when next using some other spray material, and may result in considerable "burning" of the plants, or other damage, when the spray is applied. Such injuries are frequently attributed to the insecticide which, in itself, would have been harmless to the plants had care been taken to clean out the spray tank.

Where spray equipment is used for general purposes, such as the application of "weed-killer" sprays, as well as for orchard or vegetable crop sprays, particular care should be taken to ensure that the spray tanks are thoroughly cleaned after use, and that no spray mixture residues are allowed to remain in them.

The tank should be washed out with clean water, and clean water should be pumped through the hose after use. Where oil has been used soda should be dissolved in the water used for rinsing. —ENTOMOLOGICAL BRANCH.

When Cutting Potato Seed.

ALTHOUGH there is always some risk of an uneven stand by planting cut potato "seed," because of rotting of the seed piece, the risk is not very great when planting is carried out in a well-prepared moist soil during the cooler months; thus cut seed may be safely used for the early crop.

It is important, however, that the seed sets should not be too small. Large sets have a better chance of producing sturdy sprouts under unfavourable soil conditions than small ones. The best set is one of a blocky shape, ranging from 1½ to 2 oz. in weight, and possessing at least one good eye. A 6-ounce Katahdin tuber, cut first lengthwise then crosswise, will give four good sets. When cutting seed, it is unwise to remove the rose end, as the earliest sprouts arise from this portion of the potato.

Although most growers cut their seed by hand, it is considered that a more rapid method would be to fix the cutting knife rigidly to the end of a sloping table, on which the seed is emptied, and cut the tubers as desired by pulling the potato towards one. The cutting table has many advantages where large areas are to be planted in the shortest possible time.—DIVISION OF PLANT INDUSTRY.

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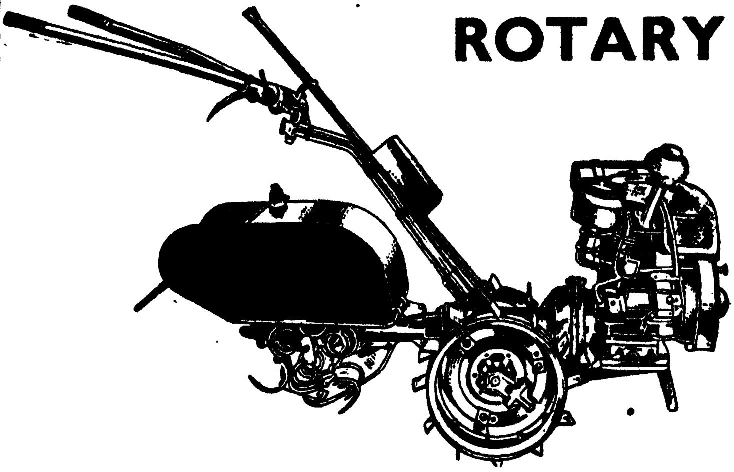

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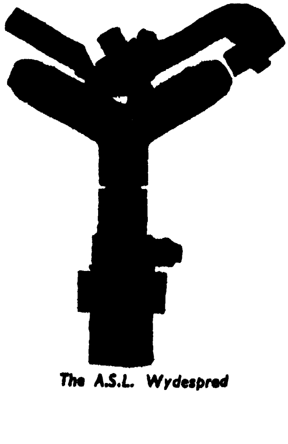

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Tubercle-free Herds

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm ...	46	29/6/49
Bradley, H. F., "Nardoo," Ashford Road Inverell (Jerseys) ...	37	15/5/49
Cattell, E. J. "Kapunda," Rob Roy, Inverell (Jerseys) ...	112	14/7/49
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires) ...	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys) ...	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)..	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ..	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.) ...	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus) ...	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys) ...	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns) ...	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jersey and Friesians) ...	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires) ...	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus) ...	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns) ...	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys) ...	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)..	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys) ...	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys) ...	36	2/5/50
New England University College, Armidale (Jerseys) ...	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys) ...	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns) ...	106	29/11/50
Police Boys' Club, Kurrajong ...	12	5/7/49
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)...	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus) ...	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus) ...	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus) ...	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys) ...	75	21/7/49
Scott, A. W. "Milong," Young (Aberdeen-Angus) ...	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns) ...	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys) ...	42	30/5/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus) ...	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys) ...	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus) ...	160	2/6/49
Wollongbar Experiment Farm (Guernseys)..	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys) ...	64	21/5/50
Yanco Experiment Farm (Jerseys) ...	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns) ...	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys) ...	107	19/8/49
Barnardo Farm School, Mowbray Park ..	45	2/6/49
Barton, S. J., "Ferndale," Appin, via Campbelltown ...	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School) ...	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colly, A. G., "Heatherbrae," Swanbrook Rd., Inverell ...	33	28/7/49
Coventry Home, Armidale ...	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell ...	13	6/6/50
De Fraine, A. N., Reservoir Hill, Inverell ...	25	27/6/49
Department of Education, Gosford Farm Home ...	29	25/2/51
Dodwell, S., Wagga ...	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell ...	42	17/3/50
Emu Plains Prison Farm ...	138	26/4/50
Fairbridge Farm School, Molong ...	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown ...	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/49
Genge, G. L., Euston, Armidale ...	32	8/10/49
Goulburn Reformatory, Goulburn ...	7	25/6/49
Grant, W. S., "Monkittee," Braidwood ...	24	10/5/49
Hague, R. T., Balmoral, Tilbuster ...	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell ...	53	1/6/51
Hart, K. H., Jersey Vale, Armidale ...	25	8/10/49
Hunt, F. W., Spencers Gully ...	63	17/3/50
Ince, F., Hillgrove Road, Armidale...	33	8/10/49
Ince, W. G., Kirkwood St., Armidale ...	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale ...	23	8/10/49
Kenmore Mental Hospital ...	31	27/7/49
Koyong School, Moss Vale ...	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell..	33	2/7/49
Lowe, W. W., Booral, via Stroud ...	73	12/3/49
Lucas, L., "Braeside," Armidale ...	27	8/10/49
Lunacy Department, Callan Park Mental Hospital ...	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital ...	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital ...	39	18/11/49
McCosker, E., "Bannockburn Station," Inverell ...	46	14/5/49
McGrath, B. J., Clyde Rd., Braidwood ...	31	13/8/49
McLane, R. G. P., Ibis Valley, Swanbrook...	17	26/6/49
McMillan, N., Duval Road, Armidale ...	32	8/10/49
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale ...	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell ...	57	5/7/50
Murray, J. A., "The Willows," Keiraville...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
Rolfe, C. D., "Rose Farm," Inverell ...	31	17/3/50
St. Ignatius' College, Riverview ...	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie ...	8	12/7/49
St. John's Hostel, Armidale ...	7	8/10/50
St. John's Orphanage, Goulburn ...	12	11/4/50
St. Patrick's Orphanage, Armidale ...	12	8/10/50
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Bay ...	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree...	60	1/4/50
Tanner, F. C., Dural Rd., Armidale...	42	8/10/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosb, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., "Spring Hills," Camden	61	7/12/49
Waddell, W., "Afton," Oakwood Rd., Inverell	127	5/7/49
Waters, A., Marsh Street, Armidale... ...	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, "Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis.

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
nverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Cattle Tick Eradication Campaign.

THE Minister for Agriculture, the Hon. E. H. Graham, M.L.A., has announced that it has been decided to postpone the tick eradication campaign which it was proposed to commence in January, 1950, for twelve months.

"I had hoped," said the Minister, "that we would have been in a position to start the concerted attack on the tick before now, but the dislocation caused by the war and its aftermath, resulted in management difficulties on properties and fences fell into disrepair. Whilst many of these have been restored, there is still a considerable amount yet to be done and labour and material have been short.

"I feel that it is advisable to postpone the campaign in the hope that we will be able to give ample notice of a start in 1951."

ROCK fern is believed to have been responsible for the death of thirty-two sheep recently on a property in the Coonabarabran district. The symptoms exhibited by the sheep strongly supported this diagnosis, which was confirmed by the presence of rock fern in the contents taken from the stomachs of affected sheep—DIVISION OF ANIMAL INDUSTRY.

CLOTHS should never be used for washing dairy utensils, according to the Division of Dairying of the Department of Agriculture. A clean scrubbing brush should be employed, the brush being allowed to dry in the sun when not in use.

Utensils should never be dried with a cloth—the heat derived from the boiling water or steam used in cleansing will cause them to dry rapidly. Dairy utensils should also be protected against dust infection.

Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Bathurst Experiment Farm (Ayrshires)	46
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	62
Dixon, R. C., "Elwatan," Castle Hill (Jerseys) ...	29
Evans, C. A., & Sons, "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P, Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	53
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	39
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	39
Rowntree, E. S., "Mourabie," Quirindi	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm	54
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	50
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A & F. J., "Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth ...	14
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	45
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief, Division of Animal Industry.

Maintenance of Cream Quality.

THERE is always a cause of inferior quality in cream—sometimes easy to find, at other times more obscure, but it is seldom impossible to discover the reason for it, points out the Division of Dairying of the Department of Agriculture.

Contrary to the belief of some farmers, the factory grader does not class cream as "second quality" if it can possibly be avoided. Dairymen may rest assured that the cream grader at the factory can differentiate between good and bad cream, and that when a can of cream is graded second quality it has a taint of some description which warrants the classification.

The trouble may be sought at some point between cow and factory, and usually it is not very difficult to trace.

Very often "second quality" cream is supplied simply because the fundamental principles governing development of flavours in cream are not understood. Informative pamphlets on this subject are obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36A, G.P.O., Sydney.

SERIOUS mortality in a mob of travelling sheep occurred recently in the Tamworth district, the losses amounting to 150. The sheep were in a hungry condition and were allowed to graze on a patch of blue couch grass. Similar mortality, though less serious, was also reported in another mob of sheep in the same district.

Blue couch has been responsible for many serious mortalities in stock in the past. After a dry spell showers often activate the growth of this grass (which contains prussic acid) and so make it attractive to stock.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O., "Fairview," Camden.
Campbell, D., "Hillangrove," Wamberal, via Gosford.
Draper, R. E., "Glengar," Capertee.
"Endeavour" Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., "Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Rydalmere Mental Hospital.
Shirley, G. F., "Camelot," Penrith.
Skarratt, A. C., Riverstone.
Wagga Agriculture College and Experiment Station.
Walker, J. R., "Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., "Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Yellow Vine Causes Mortality in Sheep.

SHEEP have died recently in north-western districts of the State as a result of eating leaves and stalks of a species of *Tribulus*, commonly known as yellow vine or Caltrop.

Both ewes and weaners have been affected. The condition occurs when sheep are hungry after being trucked or yarded and then put on country covered with the plant. There have even been mortalities after such periods of starvation, when stock have eaten withered and leafless stalks of this species.

This plant is an annual herb with leafy stems up to 3 feet long, spreading along the ground. The leaves are divided into pairs of oblong leaflets and are often silky-hairy. The flowers are small, yellow and five-petalled, and are found on stalks in the angles of the leaves.

The fruits are variously covered with spines or are spineless, and are approximately 1/3 inch in diameter. They break up into five rather woody pieces containing the seeds. These remain on the ground after the plant is dead, and when spiny may be carried long distances on the feet of animals or on the tyres of farm vehicles.

ALL the food in the world will not transform a poor-type dairy cow into a top-notch producer, but inadequate feeding is nevertheless a primary cause of the unsatisfactory level of production of New South Wales herds.

The average butter-fat production of New South Wales herds is about 150 lb. (equivalent to about 370 gallons of milk) per head per year. The potential average, that is, the average which could be obtained by good feeding, is probably about 250 lb. (about 600 gallons of milk) per year.

That this level is possible is shown by the fact that in the metropolitan areas, where feeding is better than the average, production is about 660 gallons per head. This level might not be economic in butter-fat areas, but there is not the slightest doubt that heavier and better feeding with higher average production—possibly 220 lb. of butter-fat or 500 gallons of milk per year—would mean greater financial returns to dairymen.

THE
AGRICULTURAL GAZETTE FOR AUGUST, 1949

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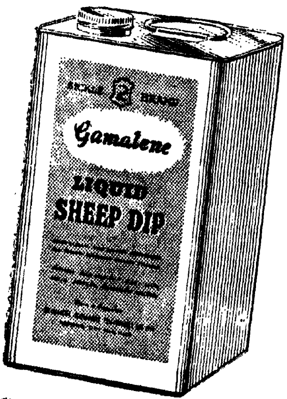

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The Agricultural Gazette of New South Wales

Editorial—

SERVICE

To the Canning Industry

THE official opening, by the acting Minister for Agriculture (Hon. W. Sheahan, M.L.A.), on 29th July, at Hawkesbury Agricultural College, of a cannery and packing house equipped on the most modern lines, further evidences the Department of Agriculture's efforts to stabilise and render more payable the fruit and vegetable industries—by improving cannery technique.

The purpose of this cannery is to provide for the instruction of students in up-to-the-minute methods of packing and processing fruits and vegetables. It will handle straight canned products, juices, jams and dried fruits and vegetables. The packing house section of this unit comprises a modern sizing and grading machine, with equipment for washing and sterilising fruits prior to packing.

In addition to training skilled fruit and vegetable preservation technologists for the industry, this model cannery at Hawkesbury Agricultural College will also undertake research into fruit and vegetable processing problems. This will fit in well with the closely-allied College activity of breeding and selection of fruits and vegetables with processing qualities superior to those now grown commercially.

In no other industry is the demand for specialised knowledge more exacting than in the canning industry. It must necessarily be so. Comparatively few cans of incorrectly processed fruit or vegetable released on to a still-not-wholly-preservation-conscious consuming public could give the canning industry a setback from which it might take years to recover. Hawkesbury College cannery will provide another safeguard against such a happening.

Consumption of canned foodstuffs has grown apace in recent years, but no canner would delude himself into believing that the canned product is well on the way to ousting the fresh kitchen-cooked article. Improved canning technique in the past quarter century, however, has so raised the wholesomeness of canned foodstuffs as to make them generally acceptable as appreciated supplements to fresh fruits and vegetables in the family fare.

But the canning industry has a greater significance than this. It is a valuable stabilising factor in the fruit and vegetable industries generally. No longer does the cannery, as in earlier days, make use merely of the surpluses of fruits and vegetables, or of products which fail to "make the grade" on the open market. Growers are now being encouraged to produce for the specialised requirements of the canning trade. In this way the requirements of canners are more adequately and satisfactorily met, and the threat of over-supplied fresh fruit and vegetables lessened.

Here again, the Department is doing good service to these industries — by selecting, breeding, introducing and testing varieties most suitable for processing..... and then distributing those improved varieties to growers.

Another 1,000 lb. Jersey Cow.

"AVON VALLEY LADYLIKE" (97168), a purebred Jersey cow, owned by Mr. J. G. Wilson, of Avon Valley, Gloucester, has completed a 365-day record, producing 16,597½ lb. of milk, 5.5 per cent. average test, and 921.69 lb. of butterfat at the age of 4 years and 9 months. This amount of butterfat is equal to 1,124.01 lb. of commercial butter.

Making this announcement, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said "Avon Valley Ladylike" established the figures under the Rules of the Division I (Official Section) of the Herd Production Improvement Scheme administered by his Department.

"Avon Valley Ladylike" was sired by "Clarendon Eyre Ruddigore 4th" (12561) from "Avon Valley Lady Eblis" (74958), which, at the age of 3 years and 5 months, produced 7,383 lb. of milk, 400.44 lb. of butterfat in 273 days.

The dam of "Avon Valley Lady Eblis," namely, "Avon Valley Lady" (38741), also produced over 1,000 lb. of butter in 365 days, her figures being 14,422½ lb. of milk, 5.9 per cent. average test, and 849.09 lb. of butterfat, equivalent to 1,034.26 lb. of commercial butter in 365 days. "Avon Valley Lady" began her record at the age of 5 years and 8 months.

Cabbage Seed Production.

FOLLOWING many complaints received from growers about the poor quality of some varieties of cabbage seed distributed, the Division of Plant Industry of the Department of Agriculture plans to develop more uniform lines of the most popular commercial varieties, Enkhuizen Glory, Copenhagen Market and Succession.

This work, it is announced, is to be done at Bathurst and Yanco Experiment Farms. Single plant selections of these varieties have already been made. It is hoped to achieve the results aimed at by further selection, combined with selfing and close breeding.

Winter Repair and Overhaul of Farm Machinery.

THE winter period usually provides the best opportunity to carry out the overhaul and repair of farm machinery. By this time most of the urgent work will have been completed—particularly on wheat farms.

A winter overhaul of the farm plant should occupy a permanent place in the farm organisation, for it enables farm operations to be undertaken with speed and efficiency. It possesses many advantages which may be summarised as follows:—

(1) Spare parts are invariably more easily obtained during the winter.

(2) If parts have to be procured from the factory, the time factor permits of their despatch in most cases by goods freight. During the rush period parts are frequently surcharged with telegraph charges and passenger rail in view of the fact that urgent delivery is required.

(3) Wet weather can be most profitably used in the workshop and, further, work indoors during such periods is far more acceptable and profitable.

(4) Invariably a trouble-free harvest is experienced as far as the mechanical side is concerned, when a thorough overhaul and servicing of farm machinery has taken place in the pre-harvest period.—MECHANISATION SECTION.

ROYAL SHOW WHEAT EXHIBITS AWARDS

Points Awarded to and Comments on the 1949 Entries

G. NICHOLSON, H.D.A.,
Special Agronomist,
and
J. R. FISHER, B.Sc. Agr., H.D.A.,
Analyst.

THE wide distribution of districts in which prize-winning entries were grown is a reflection of the suitability of the weather conditions throughout the State during 1948 for the production of high quality grain. Dry weather conditions were experienced during the latter part of the growing season, and although the ripening period of the crops was dry, pinched grain was evident in only a very few of the samples exhibited.

A feature of the wheats exhibited was the large number of comparatively new varieties entered in the various classes.

In the open classes for strong wheats, the varieties Charter and Yalta predominated, and whereas twenty-seven entries were received for class 3—the class restricted to Charter and Yalta—only four entries were received for class 2, the class restricted to Pusa 4 and Pusa 111.

In the medium-strong section, twenty-four entries were received for class 8—the open class for Gabo—whereas only three entries were received for class 7, the open class for Gular.

In judging the exhibits, points were awarded for physical characteristics of the grain-weight per bushel, appearance, trueness to type, and freedom from disease, pests, etc.—and those entries that scored satisfactorily in this section were then judged for milling and baking quality.

In many instances prize-winning entries were separated by only a very small margin out of the possible two hundred points for each entry.

THE AWARDS.

Class 1.—Commonwealth Champion Prize—Strong Wheat.

First Prize.—J. W. Eade. Variety, Pusa 4; grown at Euchareena, N.S.W., on chocolate loam; seed per acre, 45 lb.; yield per acre, 19 bushels; acreage sown, 56; no record of rainfall; autumn ploughing.

Second Prize.—J. W. Eade. Variety, Charter; grown at Euchareena, N.S.W., on chocolate loam; seed per acre, 45 lb.; yield per acre, 25 bushels; acreage sown, 60; no record of rainfall; fallow.

Class 2.—Pusa 4 or Pusa 111.

First Prize.—J. W. Eade, Euchareena. Variety, Pusa 4. (For further details, see Class 1.)

Second Prize.—White Bros. Variety, Pusa 4; grown at Boggabri, N.S.W., on heavy self-mulching loam; seed per acre, 45 lb.; yield per acre, 33 bushels; acreage sown, 50; rainfall during growth, 3.12 inches; fallow.

Third Prize.—L. J. Griffiths. Variety, Pusa 4; grown at Gunnedah, N.S.W., on red sandy loam; seed per acre, 45 lb.; yield per acre, 21 bushels; acreage sown, 60; rainfall during growth, 3 inches; fallow.

Class 3.—Charter or Yalta.

First Prize.—J. W. Eade, Euchareena. Variety, Charter. (For further details, see Class 1.)

Second Prize.—E. C. Toynton. Variety, Charter; grown at Molong, N.S.W., on chocolate loam; seed per acre, 50 lb.; yield per acre, 27 bushels; acreage sown, 52, rainfall during growth, 5.49 inches; autumn ploughing.

Third Prize.—C. B. Mahlo. Variety, Yalta; grown at Forbes, N.S.W., on heavy, self-mulching clay; seed per acre, 65 lb.; yield per acre, 34 bushels; acreage sown, 23; rainfall during growth, 6.25 inches; fallow.

Class 4.—Strong Wheat—Field Wheat Competition.

First Prize.—J. R. O'Connor. Variety, Yalta; grown at Dubbo, N.S.W., on red loam; seed per acre, 60 lb.; yield per acre, 39 bushels; acreage sown, 110; no record of rainfall; fallow.

Second Prize.—J. D. Cameron. Variety, Yalta; grown at Culgoora, N.S.W., on chocolate loam; seed per acre, 48 lb.; yield per acre, 35 bushels; acreage sown, 150; no record of rainfall; autumn ploughing.

Third Prize.—W. Dohnt. Variety, Charter; grown at Eumungerie, N.S.W., on self-mulching soil; seed per acre, 50 lb.; yield per acre, 33 bushels; acreage sown, 80; rainfall during growth, 8.20 inches; fallow.

Class 5.—Strong Wheat—Novice Class.

First Prize.—E. C. Toynton, Molong. Variety, Charter. (For further details, see Class 3.)

Second Prize.—C. B. Mahlo, Forbes. Variety, Yalta. (For further details, see Class 3.)

Third Prize.—R. W. McLaren. Variety, Yalta; grown at Barmedman, N.S.W., on heavy loam; seed per acre, 60 lb.; yield per acre, 27 bushels; acreage sown, 47; rainfall during growth, 8.70 inches; fallow.

Class 6.—Commonwealth Champion Priz Medium-Strong Wheat.

First Prize.—F. A. Cronk. Variety, Ford; grown at Boree Creek, N.S.W., on red loam and gravel; seed per acre, 60 lb.; yield per acre, 18 bushels; acreage sown, 50; rainfall during growth, 5.50 inches; fallow.

Second Prize.—J. A. and H. R. Ross, and Cullen Bros. Variety, Gabo; grown at Harden, N.S.W., on brown to red loam; seed per acre, 60 lb.; yield per acre, 42 bushels; acreage sown, 150; rainfall during growth, 13.11 inches; fallow.

Class 7.—Gular.

First Prize.—L. J. Griffiths. Grown at Gunnedah, N.S.W., on red sandy loam; seed per acre, 45 lb.; yield per acre, 21 bushels; acreage sown, 100; rainfall during growth, 3 inches; fallow.

Second Prize.—H. J. Balcomb. Grown at Toogong, N.S.W., on sandy loam; seed per acre, 60 lb.; yield per acre, 27 bushels; acreage sown, 50; rainfall during growth, 12 inches; autumn ploughing.

Third Prize.—White Bros. Grown at Boggabri, N.S.W., on heavy self-mulching loam; seed per acre, 40 lb.; yield per acre, 36 bushels; acreage sown, 50; rainfall during growth, 6.54 inches; fallow.

Class 8.—Gabo.

First Prize.—J. A. and H. R. Ross and Cullen Bros., Harden, N.S.W. (For further details, see Class 6.)

Second Prize.—J. Wall. Grown at Narrabri, N.S.W., on chocolate to sandy loam; seed per acre, 41 lb.; yield per acre, 42 bushels; acreage sown, 66; no record of rainfall; autumn ploughing.

Third Prize.—J. W. Eade. Grown at Euchareena, N.S.W., on chocolate loam; seed per acre, 50 lb.; yield per acre, 18 bushels; acreage sown, 80; no record of rainfall; autumn ploughing.

Class 9.—Kendee.

First Prize.—R. W. McLaren. Grown at Barmedman, N.S.W., on heavy clay; seed per acre, 60 lb.; yield per acre, 33 bushels; acreage sown, 61; rainfall during growth, 8.30 inches; fallow.

Second Prize.—J. Wall. Grown at Narrabri, N.S.W., on chocolate to sandy loam; seed per acre, 41 lb.; yield per acre, 40 bushels; acreage sown, 73; no record of rainfall; autumn ploughing.

Third Prize.—V. B. McGowan. Grown at Tamworth, N.S.W., on chocolate self-mulching soil; seed per acre, 45 lb.; yield per acre, 48 bushels; acreage sown, 70; rainfall during growth, 11.5 inches; fallow.

Class 10.—Celebration.

First Prize.—H. J. Harvey. Grown at Dubbo, N.S.W., on red loam; seed per acre, 50 lb.; yield per acre, 24 bushels; acreage sown, 130; rainfall during growth, 8.35 inches; fallow.

Second Prize.—T. F. Upperton. Grown at Quirindi, N.S.W., on black loam; seed per acre, 43 lb.; yield per acre, 30 bushels; acreage sown, 15; rainfall during growth, 8.5 inches; autumn ploughing.

Class 11.—Fedweb 1.

First Prize.—L. J. Griffiths. Grown at Gunnedah, N.S.W., on red sandy loam; seed per acre, 45 lb.; yield per acre, 21 bushels; acreage sown, 60; rainfall during growth, 3 inches; fallow.

Second Prize.—T. F. Upperton. Grown at Quirindi, N.S.W., on sandy loam; seed per acre, 43 lb.; yield per acre, 36 bushels; acreage sown, 52; rainfall during growth, 8.5 inches; autumn ploughing.

Class 12.—Ford.

First Prize.—F. A. Cronk, Boree Creek, N.S.W. (For further details, see Class 6.)

Second Prize.—T. H. Tout and Co. and H. W. and E. M. Kupkee. Grown at Forbes, N.S.W., on heavy clay; seed per acre, 60 lb.; yield per acre, 24 bushels; acreage sown, 350; rainfall during growth, 9.20 inches; autumn ploughing.

Third Prize.—C. B. Mahlo. Grown at Forbes, N.S.W., on heavy self-mulching clay; seed per acre, 70 lb.; yield per acre, 40 bushels; acreage sown, 51; rainfall during growth, 6.25 inches; fallow.

Class 13.—Gabo (Restricted Class).

First Prize.—J. W. Eade, Euchareena, N.S.W. (For further details, see Class 8.)

Second Prize.—C. Cassin. Grown at Wyalong, N.S.W., on dark grey self-mulching soil; seed per acre, 65 lb.; yield per acre, 36 bushels; acreage sown, 150; rainfall during growth, 6.20 inches; autumn ploughing.

Third Prize.—Day Bros. Grown at Molong, N.S.W., on chocolate loam; seed per acre, 60 lb.; yield per acre, 27 bushels; acreage sown, 90; no record of rainfall; autumn ploughing.

Class 14.—Gabo (Restricted Class).

First Prize.—J. A. and H. R. Ross and Cullen Bros., Harden, N.S.W. (For further details, see Class 6.)

Second Prize.—F. A. Cronk. Grown at Boree Creek, N.S.W., on red loam and gravel; seed per acre, 60 lb.; yield per acre, 12 bushels; acreage sown, 70; rainfall during growth, 3.25 inches; fallow.

Class 15.—Kendee (Restricted Class).

First Prize.—R. W. McLaren, Barmedman, N.S.W. (For further details, see Class 9.)

Second Prize.—S. R. Reynolds and Sons. Grown at Cumnock, N.S.W., on red loam; seed per acre, 67 lb.; yield per acre, 33 bushels; acreage sown, 55; rainfall during growth, 10.01 inches.

Class 18.—Bordan or Koala.

First Prize.—W. D. Blows and Sons. Variety: Bordan; grown at Molong, N.S.W., on red basalt; seed per acre, 58 lb.; yield per acre, 32 bushels; acreage sown, 150; rainfall during growth, 4.5 inches; spring fallow.

Second Prize.—J. E. Bruce. Variety: Koala; grown at Wongarbon, N.S.W., on heavy black soil; seed per acre, 60 lb.; yield per acre, 36 bushels; acreage sown, 70; rainfall during growth, 11.70 inches; fallow.

Class 19.—Medium-strong Wheat—Field Wheat Competition.

First Prize.—C. B. Mahlo, Forbes, N.S.W. Variety, Ford. (For further details, see Class 12.)

Second Prize.—S. B. Ceeney and E. A. Bolger. Variety, Ford; grown at Wallendbeen, N.S.W., on light soil; seed per acre, 53 lb.; yield per acre, 37 bushels; acreage sown, 50; rainfall during growth, 10 inches; fallow.

Third Prize.—Day Bros. Variety, Ford; grown at Molong, N.S.W., on chocolate loam; seed per acre, 60 lb.; yield per acre, 41 bushels; acreage sown, 130; no record of rainfall; fallow.

Class 20.—Medium-strong Wheat—Novice Class.

First Prize.—J. A. and H. R. Ross and Cullen Bros., Harden, N.S.W. Variety, Gabo. (For further details, see Class 6.)

Second Prize.—C. B. Mahlo, Forbes, N.S.W. Variety, Ford. (For further details, see Class 12.)

Third Prize.—D. T. Rankin. Variety, Ford; grown at Ungarie, N.S.W., on red soil; seed per acre, 48 lb.; yield per acre, 15 bushels; acreage sown, 100; rainfall during growth, 5.58 inches; fallow.

Class 21.—Weak Wheat.

First Prize.—J. W. Jones. Variety, Bencubbin; grown at Marrar, N.S.W., on red loam and stony outcrops; seed per acre, 50 lb.; yield per acre, 30 bushels; acreage sown, 120; rainfall during growth, 6.34; fallow.

Second Prize.—O. G. Blayney. Variety, Bencubbin; grown at Bribbaree, N.S.W., on red and sandy loam; seed per acre, 50 lb.; yield per acre, 35 bushels; acreage sown, 50; rainfall during growth, 7 inches; fallow.

Class 22.—Weak Wheat—Field Wheat Competition.

First Prize.—R. I. Camp. Variety, Bencubbin; grown at Ariah Park, N.S.W., on medium-heavy to heavy clay loam; seed per acre, 60 lb.; yield per acre, 36 bushels; acreage sown, 200; rainfall during growth, 8.93 inches; fallow.

Second Prize.—J. W. Jones, Marrar, N.S.W. Variety, Bencubbin. (For further details, see Class 21.)

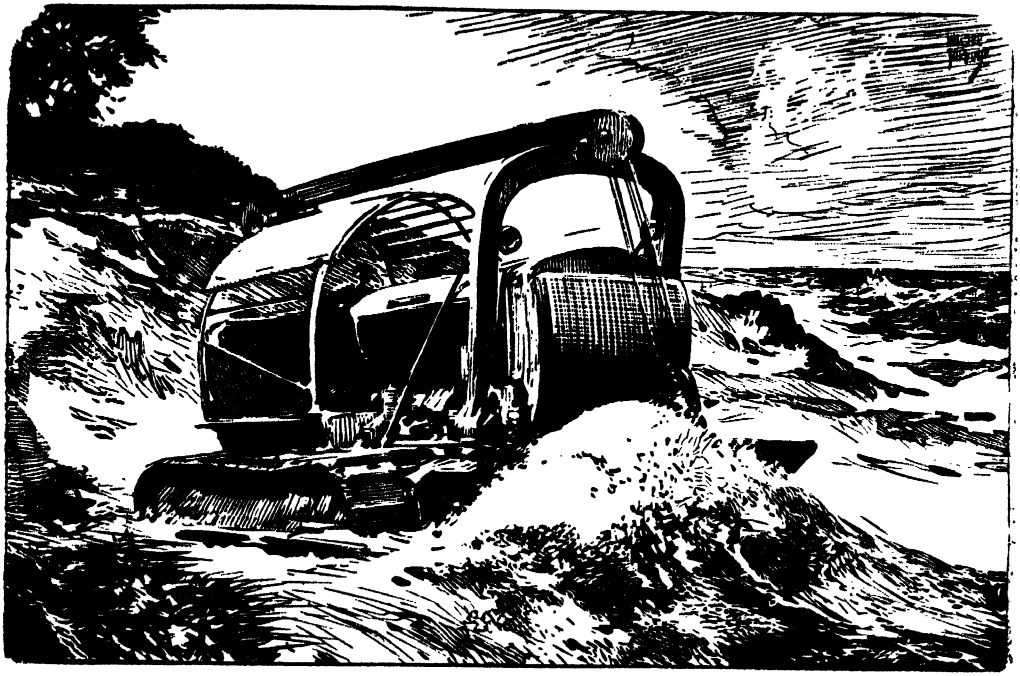
Class 23.—Weak Wheat—Novice Class.

First Prize.—J. W. Jones, Marrar, N.S.W. Variety, Bencubbin. (For further details, see Class 21.)

Second Prize.—O. G. Blayney, Bribbaree, N.S.W. Variety, Bencubbin. (For further details, see Class 21.)

Points Awarded for Grain Appearance and Milling Quality.

Variety.	District.	GRAIN. Weight per bushel. Pts.	GRAIN. Weight per bushel. lb.	GRAIN. Appearance.	GRAIN. Uniformity and Type.	GRAIN. Freedom from disease, pests.	GRAIN. Points for grain.	MILLING. Milling quality.	MILLING. Colour of flour.	MILLING. Gluten quality.	MILLING. Gluten Content. Pts.	MILLING. Gluten Content. Per cent.	MILLING. Water absorption. Pts.	MILLING. Water absorption. Per cent.	MILLING. Points for Milling.	Total Pts.
Maximum points	...	20	...	16	14	10	60	15	10	50	45	...	20	...	140	200
Class 1.—Commonwealth Champion Prize—Strong Wheat.																
Pusa 4 ...	Euchareena	16	66	15	13	9	53	9	8	49	39	16·1	17	64·0	122	175
Charter ...	Euchareena	17	67	15	13	10	55	8	8	43	37½	15·8	18	65·0	114½	169½
,, ...	Molong ...	17	67	14	12	10	53	7½	8	41	40½	16·8	18	65·0	115	168
Pusa 4 ...	Boggabri ...	14	64	13	11	10	48	8	8	47	37½	15·8	16	63·0	116½	164½
Yalta ...	Barmedman	14½	64½	13	12	10	49½	8	9	46	31½	13·9	17	64·0	111½	161
Pusa 111	Gunnedah	16½	66½	11	11	10	48½	9	8	48	30	12·1	17	64·0	112	160½
Yalta ...	Dubbo	16½	66½	14	13	10	53½	9	8	43	30	12·4	16	63·0	106	159½
,, ...	Culgoora ...	15½	65½	13	11	10	49½	10	9	39	31½	13·1	16	63·0	105½	155
Charter ...	Wyalong ...	16	66	14	11	10	51	8	8	38	33	14·3	17	64·0	104	155
,, ...	Narrabri ...	16	66	12	12	10	50	7½	8	38	31½	13·2	17	64·0	102	152
Yalta ...	,, ...	15	65	12	12	10	49	8	8	38	30	12·8	17	64·0	101	150
Pusa 4 ...	Gunnedah	17½	67½	13	12	9	51½	10	8	36	28½	11·9	16	63·0	98½	150
Charter ...	Quirindi ...	16½	66½	13	11	10	50½	8	8	35	30	12·7	18	65·0	99	149½
, ...	Boree Creek	16	66	11	10	10	47	9½	8	37	31½	13·9	16	63·0	102	149
,, ...	Dubbo ...	15	65	11	11	10	47	8	8	35	31½	13·3	17	64·0	99½	146½
Class 2.—Pusa 4 or Pusa 111.																
Pusa 4 ...	Euchareena	16	66	15	13	9	53	9	8	49	39	16·1	17	64·0	122	175
,, ...	Boggabri ...	14	64	13	11	10	48	8	8	47	37½	15·8	16	63·0	116½	164½
,, ...	Gunnedah	16½	66½	12	12	10	50½	10	9	42	30	12·7	16	63·0	107	157½
,, ...	,, ...	17½	67½	13	12	9	51½	10	8	36	28½	11·9	16	63·0	98½	150
Class 3.—Charter or Yalta.																
Charter ...	Euchareena	17	67	15	13	10	55	8	8	43	37½	15·8	18	65·0	114½	169½
,, ...	Molong ...	17	67	14	12	10	53	7½	8	41	40½	16·8	18	65·0	115	168
Yalta ...	Forbes ...	13½	63½	11	11	10	45½	7	9	47	36	15·3	18	65·0	117	162½
,, ...	Barmedman	14½	64½	13	12	10	49½	8	9	46	31½	13·9	17	64·0	111½	161
,, ...	Dubbo ...	16½	66½	14	13	10	53½	9	8	43	30	12·4	16	63·0	106	159½
,, ...	Birriwa ...	13	63	11	11	10	45	7½	9	46	31½	13·7	17	64·0	111	156
,, ...	Hillston ...	15	65	12	10	10	47	7½	9	43	31½	13·4	17	64·0	108	155
,, ...	Culgoora ...	15½	65½	13	11	10	49½	10	9	39	31½	13·1	16	63·0	105½	155
Charter ...	Wyalong ...	16	66	14	11	10	51	8	8	38	33	14·3	17	64·0	104	155
Yalta ...	Dubbo ...	14½	64½	12	11	10	47½	7	9	45	30	12·8	16	63·0	107	154½
,, ...	Tamworth	15½	65½	12	11	10	48½	9	9	40	30	12·6	16	63·0	104	152½
Charter ...	Eumungerie	15	65	13	13	10	51	7	9	36	30	12·1	19	66·0	101	152
,, ...	Narrabri ..	16	66	12	12	10	50	7½	8	38	31½	13·2	17	64·0	102	152
,, ...	Berrigan ...	16	66	13	12	10	51	7	9	35	31½	13·5	18	65·0	100½	151½
Yalta ...	Narrabri ...	15	65	12	12	10	49	8	8	38	30	12·8	17	64·0	101	150
Charter ...	Quirindi ...	16½	66½	13	11	10	50½	8	8	35	30	12·7	18	65·0	99	149½
,, ...	Boree Creek	16	66	11	10	10	47	9½	8	37	31½	13·9	16	63·0	102	149
,, ...	Dubbo ...	15	65	11	11	10	47	8	8	35	31½	13·3	17	64·0	99½	146½
,, ...	Currabubula	16	66	11	11	10	48	7	9	36	27	10·8	19	66·0	98	146
,, ...	Gunnedah	16½	66½	12	11	10	49½	8½	9	34	27	10·8	16	63·0	94½	144
Class 4.—Strong White Wheat—Field Wheat Competition.																
Yalta ...	Dubbo ...	16½	66½	14	13	10	53½	9	8	43	30	12·4	16	63·0	106	159½
,, ...	Culgoora ...	15½	65½	13	11	10	49½	10	9	39	31½	13·1	16	63·0	105½	155
Charter ...	Eumungerie	15	65	13	13	10	51	7	9	36	30	12·1	19	66·0	101	152
,, ...	Berrigan ...	16	66	13	12	10	51	7	9	35	31½	13·5	18	65·0	100½	151½
,, ...	Dubbo ...	15	65	11	11	10	47	8	8	35	31½	13·3	17	64·0	99½	146½
Class 5.—Strong Wheat—Novice Class.																
Charter ...	Molong ...	17	67	14	12	10	53	7½	8	41	40½	16·8	18	65·0	115	168
Yalta ...	Forbes ...	13½	63½	11	11	10	45½	7	9	47	36	15·3	18	65·0	117	162½
,, ...	Barmedman	14½	64½	13	12	10	49½	8	9	46	31½	13·9	17	64·0	111½	161
,, ...	Dubbo ...	16½	66½	14	13	10	53½	9	8	43	30	12·4	16	63·0	106	159½
,, ...	Trundle ...	16	66	14	12	10	52	7	9	43	28½	11·8	17	64·0	104½	156½
,, ...	Culgoora ...	15½	65½	13	11	10	49½	10	9	39	31½	13·1	16	63·0	105½	155
,, ...	Tamworth	15½	65½	12	11	10	48½	9	9	40	30	12·6	16	63·0	104	152½
Charter ...	Eumungerie	15	65	13	13	10	51	7	9	36	30	12·1	19	66·0	101	152
Pusa 4 ...	Gunnedah	17½	67½	13	12	9	51½	10	8	36	28½	11·9	16	63·0	98½	150
Charter ...	Boree Creek	16	66	11	10	10	47	9½	8	37	31½	13·9	16	63·0	102	149
,, ...	Dubbo ...	15	65	11	11	10	47	8	8	35	31½	13·3	17	64·0	99½	146½
,, ...	Gunnedah	16½	66½	12	11	10	49½	8½	9	34	27	10·8	16	63·0	94½	144
Class 6.—Commonwealth Champion Prize—Medium Strong Wheats.																
Ford ...	Boree Creek	15	65	12	11	9½	47½	14½	10	35	39	16·2	10½	55·0	109	156½
Gabo ...	Harden ...	14½	64½	14	13	10	51½	11½	9	37	31½	13·3	15	62·0	104	155½
Ford ...	Forbes ...	14½	64½	13	12	10	49½	12½	9	35	39	16·4	10	54·0	105½	155
,, ...	Ungarie ...	14½	64½	12	11	10	47½	12½	10	34	39	16·4	10	54·0	105½	153
,, ...	Wallendbeen	16	66	13	11	10	50	14½	9	34	34½	14·7	10½	55·0	102½	152½
,, ...	Molong ...	17	67	15	13	10	55	14½	10	32	30	12·2	10	54·0	96½	151½
,, ...	,, ...	17	67	15	13	10	55	15	9	32	30	12·1	10	54·0	96	151



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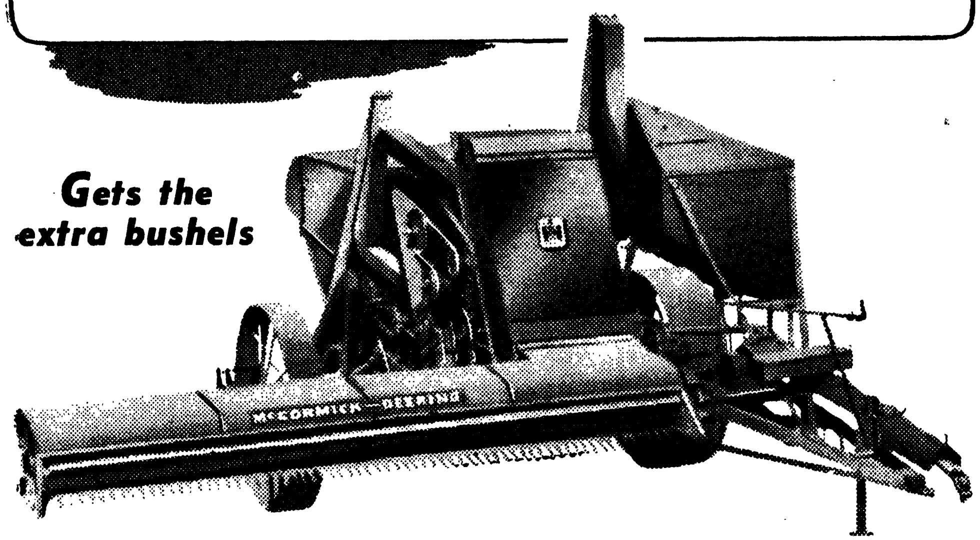

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Will gather, thresh, and clean efficiently at speeds up to 5½ miles per hour

The McCormick-Deering GL-200 *Power-Drive* Header Harvester brings to every grain grower using tractor power, all the labour and time-saving benefits of "One-Man harvesting". There's a new ease of control for the tractor driver, and a new "high" in harvesting efficiency at speeds up to 5½ miles per hour.

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Made in 12-foot size with 30-bushel grain tank, on steel wheels or rubber. Fits all makes of tractors with standard A.S.A.E. power take-off and drawbar dimensions.

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INTERNATIONAL HARVESTER

Points Awarded for Grain Appearance and Milling Quality—*continued.*

Variety.	District.	GRAIN. Weight per bushel. Pts.	Weight per bushel. lb.	Appearance.	Uniformity and Type.	Freedom from disease, pests.	Points for grain.	MILLING. Milling quality.	Colour of flour.	Gluten quality.	Gluten Content. Pts.	Gluten Content. Per cent.	Water absorption. Pts.	Water absorption. Per cent.	Points for Milling.	Total Pts.
Maximum points ...	... ...	20	...	16	14	10	60	15	10	50	45	...	20	...	140	200
Class 6.—Commonwealth Champion Prize—Medium Strong Wheats—*continued.*																
Gabo	Narrabri	13½	63½	12	11	9½	46	11	9	37	31½	13·4	15	62·0	103½	149½
,, ...	Euchareena ...	15	65	12	12	9½	48½	10	9	35	30	12·4	16	63·0	100	148½
Kendee ...	Barmedman ...	13	63	11	11	10	45	10½	10	35	31½	13·7	16	63·0	103	148
Gabo	Bingara	13	63	11	11	10	45	10½	9	36	33	14·1	14	61·0	102½	147½
Kendee	Narrabri	13½	63½	13	12	10	48½	10½	9	33	30	12·5	16	63·0	98½	147
Ford	Gunnedah ...	17	67	15	13	10	55	14½	9	29	28½	11·4	10	54·0	91	146
Kendee	Tamworth ...	14	64	14	12	10	50	11	9	32	28½	11·8	15	62·0	95½	145½
,, ...	Dubbo	13½	63½	13	12	9	47½	11	9	31	30	12·3	15	62·0	96	143½
Gabo	Molong	15	65	13	12	9½	49½	10½	9	32	28½	11·8	14	61·0	94	143½
Gular	Boggabri	12	62	10	10	10	42	10½	9	37	30	12·5	14	61·0	100½	142½
Gabo	Hillston	13½	63½	11	11	10	45½	10	9	34	30	12·1	14	61·0	97	142½
No. 26(unnamed)	Parkes	16	66	15	13	10	54	10	10	25	27	10·8	14	61·0	86	140
Gabo	Currabubula ...	13	63	11	10	10	44	10	9	33	28½	11·8	15	62·0	95½	139½
,, ...	Upperton	13½	63½	11	11	10	45½	9½	9	32	27	10·6	15	62·0	92½	138
Fedweb 1 ...	Gunnedah ...	15½	65½	12	12	10	49½	11	9	28	27	10·2	13	60·0	88	137½
Kendee	Cumnock	11½	61½	10	9	7	37½	9½	9	35	30	12·6	16	63·0	99½	137
Koala	Wongarbon ...	12½	62½	11	11	10	44½	12½	9	30	27	10·8	12½	59·0	91	135½
Class 7.—Gular.																
Gular	Gunnedah ...	14½	64½	12	12	9½	48	11	9	36	30	12·8	14	61·0	100	148
,, ...	Toogong	13½	63½	12	11	10	46½	10	9	36	30	12·2	15	62·0	100	146½
,, ...	Boggabri	12	62	10	10	10	42	10½	9	37	30	12·5	14	61·0	100½	142½
Class 8.—Gabo.																
Gabo	Harden	14½	64½	14	13	10	51½	11½	9	37	31½	13·3	15	62·0	104	155½
,, ...	Narrabri	13½	63½	12	11	9½	46	11	9	37	31½	13·4	15	62·0	103½	149½
,, ...	Euchareena ...	15	65	12	12	9½	48½	10	9	35	30	12·4	16	63·0	100	148½
,, ...	Gunnedah ...	14	64	11	11	10	46	10½	9	37	31½	13·3	14	61·0	102	148
,, ...	Wyalong	13	63	12	11	10	46	10	9	37	31½	13·6	14	61·0	101½	147½
,, ...	Bingara	13	63	11	11	10	45	10½	9	36	33	14·1	14	61·0	102½	147½
,, ...	Currabubula ...	11½	61½	10	10	9½	41	10	9	39	31½	13·4	15	62·0	104½	145½
,, ...	Boggabri	9½	59½	8	7	10	34½	9½	9	38	40½	16·5	13	60·0	110	144½
,, ...	Molong	15	65	13	12	9½	49½	10½	9	32	28½	11·8	14	61·0	94	143½
,, ...	Dubbo	12	62	11	11	10	44	10	9	35	30	12·2	15	62·0	99	143
,, ...	Hillston	13½	63½	11	11	10	45½	10	9	34	30	12·1	14	61·0	97	142½
,, ...	Culgoora	10	60	9	10	9½	38½	11	9	38	30	12·8	14	61·0	102	140½
,, ...	Boree Creek ...	11½	61½	10	11	8	40½	10	9	36	30	12·3	15	62·0	100	140½
,, ...	Ungarie	11	61	9	9	10	39	10	9	37	31½	13·9	14	61·0	101½	140½
,, ...	Currabubula ...	13	63	11	10	10	44	10	9	33	28½	11·8	15	62·0	95½	139½
,, ...	Quirindi	13½	63½	11	11	10	45½	9½	9	32	27	10·6	15	62·0	92½	138
Class 9.—Kendee.																
Kendee	Barmedman ...	13	63	11	11	10	45	10½	10	35	31½	13·7	16	63·0	103	148
,, ...	Narrabri	13½	63½	13	12	10	48½	10½	9	33	30	12·5	16	63·0	98½	147
,, ...	Tamworth ...	14	64	14	12	10	50	11	9	32	28½	11·8	15	62·c	95½	145½
,, ...	Dubbo	13½	63½	13	12	9	47½	11	9	31	30	12·3	15	62·0	96	143½
,, ...	Quirindi	12½	62½	12	12	10	46½	10½	9	33	30	12·1	14	61·0	96½	143
,, ...	Dubbo	12	62	11	11	10	44	11½	9	31	28½	11·6	14	61·0	94	138
Class 10.—Celebration.																
Celebration ...	Dubbo	10½	60½	8	10	10	38½	10½	10	33	31½	13·7	13	60·0	98	136½
,, ...	Quirindi	11	61	8	10	10	39	10	10	33	28½	11·4	12½	59·0	94	133
Class 11.—Fedweb 1.																
Fedweb 1 ...	Gunnedah ...	15½	65½	12	12	10	49½	11	9	28	27	10·2	13	60·0	88	137½
,, ...	Quirindi	13½	63½	10	10	10	43½	12	9	31	27	10·6	13	60·0	92	135½
Class 12.—Ford.																
Ford	Boree Creek ...	15	65	12	11	9½	47½	14½	10	35	39	16·2	10½	55·0	109	156½
,, ...	Forbes	14½	64½	13	12	10	49½	12½	9	35	39	16·4	10	54·0	105½	155
,, ...	,, ...	13½	63½	11	10	10	44½	14	9	34	42	17·4	10½	55·0	109½	154
,, ...	Ungarie	14½	64½	12	11	10	47½	12½	10	34	39	16·4	10	54·0	105½	153
,, ...	Wallendbeen ...	16	66	13	11	10	50	14½	9	34	34½	14·7	10½	55·0	102½	152½
,, ...	Molong	17	67	15	13	10	55	14½	10	32	30	12·2	10	54·0	96½	151½
,, ...	,, ...	17	67	15	13	10	55	15	9	32	30	12·1	10	54·0	96	151
,, ...	The Rock ...	15½	65½	13	10	8	46½	15	10	33	34½	14·6	10½	55·0	103	149½
,, ...	Gunnedah ...	17	67	15	13	10	55	14½	9	29	28½	11·4	10	54·0	91	146
,, ...	Quirindi	14	64	11	10	10	45	14	9	32	28½	11·4	10½	55·0	94	139
Class 13.—Gabo.																
Gabo	Euchareena ...	15	65	12	12	9½	48½	10	9	35	30	12·4	16	63·0	100	148½
,, ...	Wyalong	13	63	12	11	10	46	10	9	37	31½	13·6	14	61·0	101½	147½
,, ...	Molong	15	65	13	12	9½	49½	10½	9	32	28½	11·8	14	61·0	94	143½
,, ...	Hillston	13½	63½	11	11	10	45½	10	9	34	30	12·1	14	61·0	97	142½
,, ...	Ungarie	11	61	9	9	10	39	10	9	37	31½	13·9	14	61·0	101½	140½

Points Awarded for Grain Appearance and Milling Quality—*continued.*

		GRAIN.						MILLING.								
Variety.	District.	Weight per bushel.		Appearance.	Uniformity and Type.	Freedom from disease, pests.	Points for grain.	Milling quality.	Colour of flour.	Gluten quality.	Gluten Content.		Water absorption.		Points for Milling.	Total Pts.
		Pts.	lb.								Pts.	Per cent.	Pts.	Per cent.		
Maximum points		20	...	16	14	10	60	15	10	50	45	...	20	...	140	200
Class 14.—Gabo.																
Gabo	Harden	14½	64½	14	13	10	51½	11½	9	37	31½	13·3	15	62·0	104	155½
"	Boree Creek ...	11½	61½	10	11	8	40½	10	9	36	30	12·3	15	62·0	100	140½
Class 15.—Kendee.																
Kendee ...	Barmedman ...	13	63	11	11	10	45	10½	10	35	31½	13·7	16	63·0	103	148
"	Cumnock	11½	61½	10	9	7	37½	9½	9	35	30	12·6	16	63·0	99½	137
Class 18.—Bordan or Koala.																
Bordan	Molong	14	64	13	12	10	49	12	9	30	30	12·8	11	56·0	92	141
Koala	Wongarbon ...	12½	62½	11	11	10	44½	12½	9	30	27	10·8	12½	59·0	91	135½
Class 19.—Medium Strong Wheat—Field Wheat Competition.																
Ford	Forbes	13½	63½	11	10	10	44½	14	9	34	42	17·4	10½	55·0	109½	154
"	Wallendbeen ...	16	66	13	11	10	50	14½	9	34	34½	14·7	10½	55·0	102½	152½
"	Molong	17	67	15	13	10	55	14½	10	32	30	12·2	10	54·0	96½	151½
Gabo	Narrabri	13½	63½	12	11	9½	46	11	9	37	31½	13·4	15	62·0	103½	149½
Kendee	Barmedman ...	13	63	11	11	10	45	10½	10	35	31½	13·7	16	63·0	103	148
Gabo	Bingara	13	63	11	11	10	45	10½	9	36	33	14·1	14	61·0	102½	147½
"	Wyalong	13	63	12	11	10	46	10	9	37	31½	13·6	14	61·0	101½	147½
Kendee	Tamworth ...	14	64	14	12	10	50	11	9	32	28½	11·8	15	62·0	95½	145½
Gabo	Boggabri	9½	59½	8	7	10	34½	9½	9	38	40½	16·5	13	60·0	110	144½
Kendee	Dubbo	13½	63½	13	12	9	47½	11	9	31	30	12·3	15	62·9	96	143½
Bordan	Molong	14	64	13	12	10	49	12	9	30	30	12·8	11	56·0	92	141
Gabo	Wellington ...	10	60	8	9	10	37	11	9	37	30	12·1	15	62·0	102	139
No. 2 Unnamed..	Parkes	15	65	14	13	10	52	12	9	24	30	12·2	10	54·0	85	137
Kendee	Cumnock	11½	61½	10	9	7	37½	9½	9	35	30	12·6	16	63·0	99½	137
Koala	Wongarbon ...	12½	62½	11	11	10	44½	12½	9	30	27	10·8	12½	59·0	91	135½
Class 20.—Medium Strong Wheat—Novice Class.																
Gabo	Harden	14½	64½	14	13	10	51½	11½	9	37	31½	13·3	15	62·0	104	155½
Ford	Forbes	13½	63½	11	10	10	44½	14	9	34	42	17·4	10½	55·0	109½	154
"	Ungarie	14½	64½	12	11	10	47½	12½	10	34	39	16·4	10	54·0	105½	153
"	Wallendbeen ...	16	66	13	11	10	50	14½	9	34	34½	14·7	10½	55·0	102½	152½
"	Molong	17	67	15	13	10	55	15	9	32	30	12·1	10	54·0	96	151
Kendee	Barmedman ...	13	63	11	11	10	45	10½	10	35	31½	13·7	16	63·0	103	148
Gabo	Bingara	13	63	11	11	10	45	10½	9	36	33	14·1	14	61·0	102½	147½
Gular	Toogong	13½	63½	12	11	10	46½	10	9	36	30	12·2	15	62·0	100	146½
Ford	Gunnedah ...	17	67	15	13	10	55	14½	9	29	28½	11·4	10	54·0	91	146
Kendee	Tamworth ...	14	64	14	12	10	50	11	9	32	28½	11·8	15	62·0	95½	145½
Gabo	Molong	15	65	13	12	9½	49½	10½	9	32	28½	11·8	14	61·0	94	143½
Gabo	Hillston	13½	63½	11	11	10	45½	10	9	34	30	12·1	14	61·0	97	142½
Bordan	Molong	14	64	13	12	10	49	12	9	30	30	12·8	11	56·0	92	141
Gabo	Culgoora	10	60	9	10	9½	38½	11	9	38	30	12·8	14	61·0	102	140½
"	Currabubula ...	13	63	11	10	10	44	10	9	33	28½	11·8	15	62·0	95½	139½
Koala	Wongarbon ...	12½	62½	11	11	10	44½	12½	9	30	27	10·8	12½	59·0	91	135½
Class 21.—Weak Wheat.																
Bencubbin ...	Marrar	12	62	11	11	9	43	12	9	29	30	12·4	10	54·0	90	133
" ...	Bribbaree	12	62	11	11	9	43	12½	9	28	28½	11·1	10	54·0	88	131
" ...	Hillston	11½	61½	11	12	10	44½	12½	10	26	27	10·2	10	54·0	85½	130
" ...	Weja	11½	61½	11	12	10	44½	12	10	26	27	10·2	10	54·0	85	129½
" ...	Barmedman ...	11	61	10	11	10	42	12½	9	27	28½	11·6	10	54·0	87	129
" ...	Wongarbon ...	11½	61½	9	10	10	40½	12½	9	27	28½	11·4	10	54·0	87	127½
Class 22.—Weak Wheat—Field Wheat Competition.																
Bencubbin ...	Ariah Park ...	13½	63½	12	11	10	46½	12½	9	27	28½	11·0	10	54·0	87	133½
" ...	Marrar	12	62	11	11	9	43	12	9	29	30	12·4	10	54·0	90	133
Quadrat ...	Finley	15	65	13	12	8½	48½	13½	9	24	28½	11·8	8½	51·0	83½	132
Bencubbin ...	Bribbaree	12	62	11	11	9	43	12½	9	28	28½	11·1	10	54·0	88	131
" ...	Hillston	11½	61½	11	12	10	44½	12½	10	26	27	10·2	10	54·0	85½	130
" ...	Weja	11½	61½	11	12	10	44½	12	10	26	27	10·2	10	54·0	85	129½
" ...	Barmedman ...	11	61	10	11	10	42	12½	9	27	28½	11·6	10	54·0	87	129
Class 23.—Weak Wheat—Novice Class.																
Bencubbin ...	Marrar ...	12	62	11	11	9	43	12	9	29	30	12·4	10	54·0	90	133
" ...	Bribbaree ...	12	62	11	11	9	43	12½	9	28	28½	11·1	10	54·0	88	131
" ...	Hillston ...	11½	61½	11	12	10	44½	12½	10	26	27	10·2	10	54·0	85½	130
" ...	Barmedman	11	61	10	11	10	42	12½	9	27	28½	11·6	10	54·0	87	129
" ...	Wongarbon	11½	61½	9	10	10	40½	12½	9	27	28½	11·4	10	54·0	87	127½

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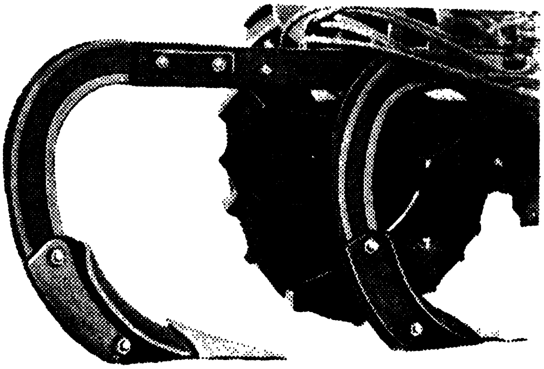

Over 400 N.S.W. graziers have destroyed rabbits the Ferguson way.

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The Provision of

FODDER FOR STOCK

In the Orange, Bathurst and Molong Districts

(*Continued from page* 343.)

R. C. MADSEN, H.D.A., District Agronomist.

THE fairly severe winter conditions experienced in this area make it essential that farmers and graziers practise supplementary feeding in order to maintain the production and disease resistance of their stock.

The purpose of this article is to set out the value of the many pasture plants and fodder crops available for use in this area. In the first portion, published last month, the author discussed the need for rotations to maintain soil fertility and methods of utilization of pastures. In this continuation details are given of useful pasture species and recommendations are made of pasture mixtures.

Notes on Pasture Species.

Subterranean Clover.

(*a*) *Mid-season Strain.*—The mid-season strain of Subterranean clover is the wonder plant of the 24-inch and over rainfall country. It is a free-seeding, vigorous-growing annual and thousands of acres have been established, particularly on the tablelands, where it is the basis of all pasture improvement work. The seed germinates in late summer and autumn; the plants grow slowly through the winter and vigorously in the spring. Seed is set in late spring and early summer when the plants die.

A very dense sward is soon formed, providing considerable bulk and a highly nutritious fodder both in the green and dry stage Excellent quality hay—up to 4 tons or more per acre—may be made in good seasons; this should be baled if possible.

This species is outstanding as a soil improver, for the control of soil erosion, and the forcing out of inferior species. It may be grown on all soil types on the tableland areas, but on the lighter soils only in the 22-24 inch rainfall area. In combination with either Perennial rye, *Phalaris tuberosa*, lucerne or Wimmera rye it makes an ideal mixture.

(*b*) *Early Strain.*—This is most suited to the 22-24 inch rainfall area, but does not provide the same bulk of feed as mid-season strain.

Lucerne.

Lucerne is the "King of Fodders" on the Central Slopes. It is valuable both for grazing and hay production, being of very high fodder value, is drought-resistant, and long-lived if correctly managed. Though continuous grazing will rapidly thin out the stand, it is the chief summer grazing crop on the Central Slopes. First cut river flat lucerne on the slopes is frequently conserved as silage, owing to the presence of barley grass and other extraneous plants. The deeper, well-drained soils of moderate fertility are required for a successful stand.

The grazing period on the tablelands is short, hence its use is limited in those areas.

Red Clover.

Red clover is mainly a spring and summer grower and, although considered a perennial, usually only lasts about three to four years. Its use is limited to the higher rainfall areas of the tablelands, *e.g.*, Oberon and Yetholme, although it grows satisfactorily in Orange, Millthorpe, Blayney and similar areas in normal seasons. Subterranean clover (mid-season strain) has been grown more successfully during recent years, because of sub-normal rainfall.

In pasture mixtures, on good soils, Red clover will provide early grazing until other clovers have become established and it is valuable for short-term pastures in rotation with such crops as potatoes. It is ideal,

where arable areas are limited, to raise fertility and thus increase yields of succeeding crops. Excellent grazing is provided and it may be cut for hay.

In the Oberon and Yetholme districts Red clover makes a good mixed grazing stand when sown with Italian rye in a temporary pasture.

White Clover.

White clover is a perennial which has the advantage over other clovers of providing green feed during the summer. However, it only thrives on the best soils and where moisture is plentiful; it will not persist during long dry spells. With efficient management it will produce a considerable amount of bulk throughout the year and not have the smothering effect on other species of pasture plants, as is the case with Subterranean clover. White clover is very nutritious and is ideal for a mixture, particularly in the Oberon and Yetholme areas, and in moist situations elsewhere.

Strawberry Clover.

This clover is a perennial that thrives only in the very moist places in the Oberon and Yetholme districts in particular, where it provides excellent all-the-year-round feed. It cannot be considered to be as important as the three earlier mentioned clovers, as suitable areas are very restricted.

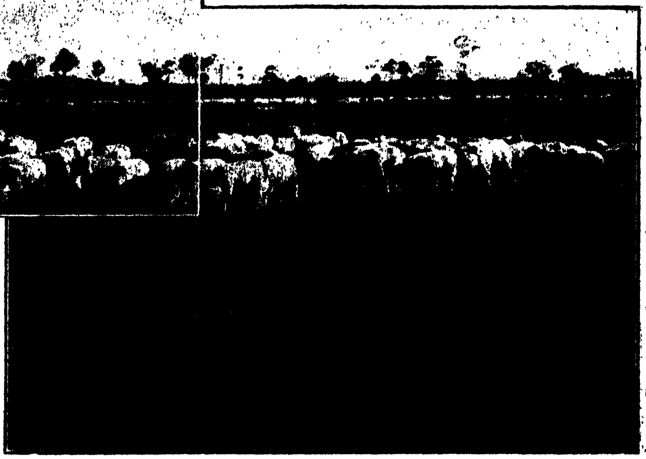
Ball Clover.

An annual, more dry-weather-resistant than Subterranean clover, this species occurs throughout tableland areas and slopes.

It is useful on the heavier soils of the slopes where Subterranean clover will not thrive; it responds readily to superphosphate and must be topdressed for best results.

Barrel Clover.

Barrel clover is an annual, somewhat similar to burr trefoils, but the seed pods do not adhere as readily to wool. It has proved successful on the tablelands and slopes and in the Bathurst district. Greater use could be made of this species.

A Good Stand of Grazing Lucerne on the Central Slopes.

Wimmera Rye Grass.

Wimmera rye is a vigorous, free-seeding annual which grows rapidly and provides a large bulk of feed and a remarkable amount of seed. Being very resistant to dry weather it can be sown successfully anywhere on the Central Slopes and Tablelands but is most valuable on the former. Although it is inclined to disappear from a pasture after about two years under normal grazing conditions, particularly on the soils likely to set, renovation or cultivation will stimulate regeneration.

Its palatability is appreciated by all classes of stock, and its special value is that the seed is not detrimental to sheep and provides a seed-free area on which lambs can be weaned and fattened.

On the wheat areas of the Central Slopes it should be sown only on areas which are to be given over to grazing for a few years, as it is a rapid grower and profuse seeder. In a mixture with lucerne or grazing oats renovated into natural pastures, it is ideal.

Perennial Rye Grass.

A long-lived perennial which, under favourable conditions, provides succulent and highly nutritious feed over a long period. Perennial rye grass requires a good soil with a comparatively high, well-distributed rainfall, as it is not very dry-weather-resistant. On the poorer soils it is necessary to build up the fertility before sowing to obtain the maximum results. When sown with Subterranean clover or White clover it makes an ideal mixture.

Italian Rye Grass.

This grass is a vigorous biennial which, under favourable conditions, produces a great bulk of feed during winter and spring, and may be sown to advantage with Subterranean or Red clover in a short term pasture in rotation with crops on the tablelands. It is not as hardy as Wimmera Rye grass.

Phalaris Tuberosa.

Phalaris tuberosa is a perennial, and one of the most valuable of all grasses, producing an abundance of long, broad leaves and large crowns, and is very deep-rooted. Although it dislikes competition from other grasses in its early life, it is extremely hardy once established and comparatively dry-weather-resistant.

Like all grasses *Phalaris tuberosa* is best associated with Subterranean clover for fattening and milk production. When grown with a legume such as Subterranean clover, and cut when the heads are emerging from the leaf sheaths, it makes a palatable hay. Drastic renovation every five or six years is required to break up the large crowns.

Pasture Mixtures.

1. Tableland (except Bathurst).

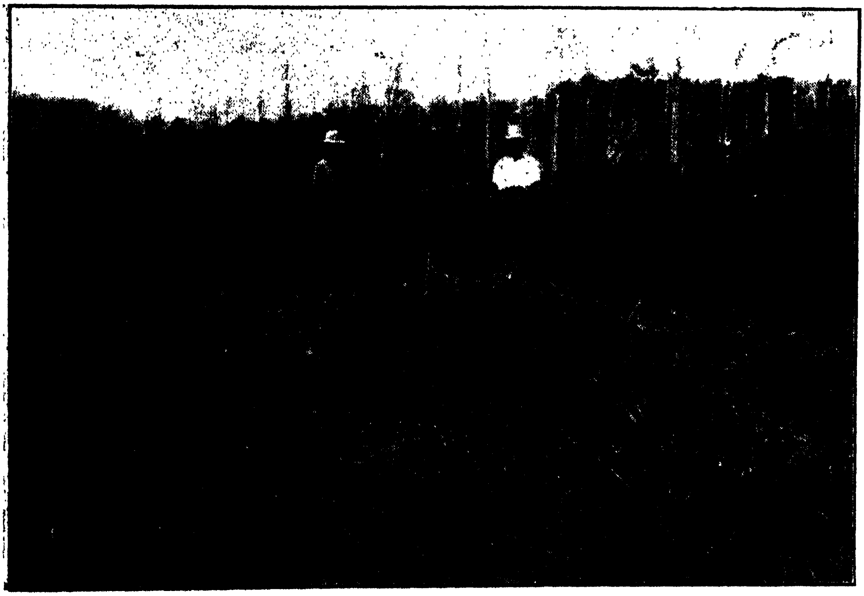
Medium to rich, heavy soils, creek flats, etc.

(*a*) Perennial rye grass—7-8 lb. per acre.

Mid-season strain Subterranean clover—3-4 lb. per acre.

Red clover—1 lb. per acre.

(On damp flats 1 lb. of White clover and 1 lb. of Strawberry clover may be used instead of Subterranean clover.)



A Heavy Growth of Red Clover.

Ewe Hoggets Grazing on a Perennial Rye Subterranean Clover Pasture in the Orange District.

(*b*) *Phalaris tuberosa*—2-3 lb. per acre.
Mid-season strain Subterranean clover—3-4 lb. per acre.

(*c*) Red clover (temporary pasture)—4 lb. per acre.

(*d*) Lucerne (limited areas only)—6-8 lb. per acre.

Poor Soils.

Mid-season strain Subterranean clover—2-3 lb. per acre.

Wimmera rye—2 lb. per acre.

2. Bathurst Area.

Rich Flats.

(*a*) Lucerne—8-10 lb. per acre.

(*b*) Lucerne—4 lb. per acre.
Phalaris tuberosa—1 lb. per acre.
Mid-season strain Subterranean clover—2 lb. per acre.
Early strain Subterranean clover—1 lb. per acre.

Upland Granites.

Lucerne—3-4 lb. per acre.

Wimmera rye—1-2 lb. per acre.

Mid-season strain Subterranean clover—2 lb. per acre.

Early strain Subterranean clover—1 per acre.

3. Central Slopes.

Lighter Soils.

Mid-season strain Subterranean clover—2-3 lb. per acre.

Wimmera rye—1-2 lb. per acre.

Heavy Red Soils.

(*a*) Early strain Subterranean clover—2 lb. per acre.
Ball clover—2 lb. per acre.
Wimmera rye—1-2 lb. per acre.

(*b*) Lucerne—3-4 lb. per acre.
Wimmera rye—1-2 lb. per acre.

Alluvium Flats.

Lucerne—10-12 lb. per acre.

(To be continued.)

PRODUCTION of main crop citrus fruit for 1949 is forecast by the Division of Marketing and Agricultural Economics at 3,294,000 loose bushels, or 2,635,200 packed bushels.

This anticipated yield is just a little below the annual average of 2,800,000 packed bushels. The crop, however, will be much smaller than last season's, when 3,794,000 bushels were harvested.

Good rains, by increasing fruit size, offset to some extent an earlier lack of rain which had been partly responsible for poor setting of fruit.

IN a rice variety trial at Yanco Experiment Farm during the past season, Caloro 2 proved superior to any of the new crossbreds under trial.

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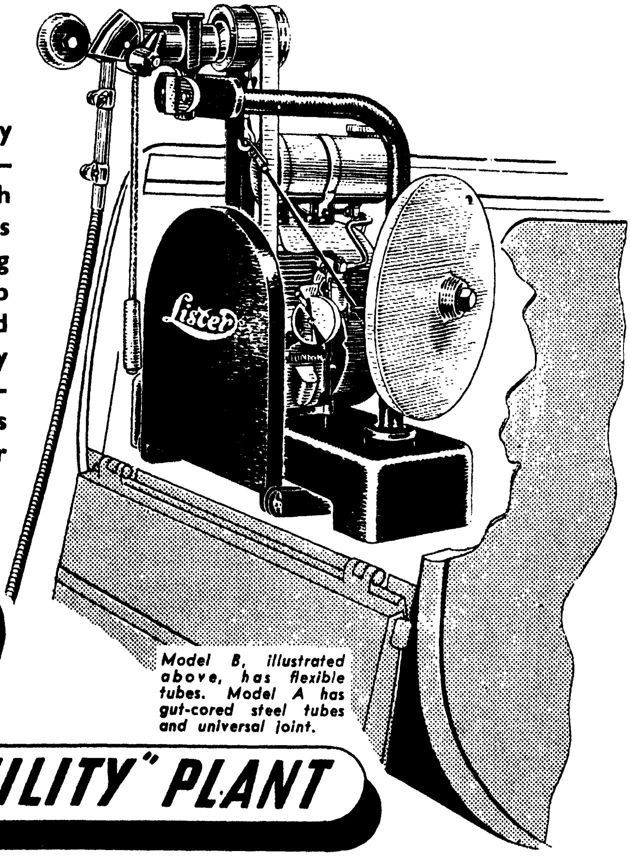

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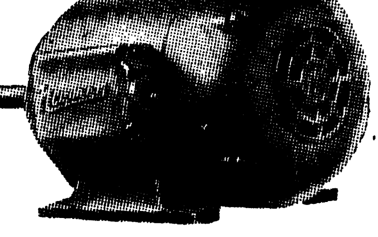

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

BUYING A FARM?

AS a result of the high prices which farmers and graziers have been receiving for the last four to five years, there are to-day many people attempting or intending to purchase properties, either to enlarge farms already owned or to set up as owner-operators. The purpose of this article is to discuss ways in which farmers and others intending to buy properties can estimate the income-producing capacity of a given farm.

Of course, some people may desire to own land at all costs, and may be willing to pay almost any price for it; but the majority of buyers are interested in the return they can expect from their investment. Also, many intending purchasers have to obtain a loan prior to purchase, and they are naturally interested in obtaining sufficient income to meet interest payments and other charges on loans incurred.

The first step in assessing the income-producing capacity of a property is obviously to make a thorough and detailed inspection of the property in question. In addition to the information secured from the prospective vendor, yields and carrying capacity should be checked by seeking advice from anyone familiar with the history of the property, or by consulting statistical records regarding average yields, carrying capacity and rainfall in the particular district. Other factors which should be looked into include evidence of erosion, declining fertility, susceptibility to floods, disease, weeds, etc.

These details regarding the physical productivity must be obtained before it is possible to estimate the income-producing capacity of a property. But obviously it is not sufficient to know only that a property has an average wheat yield of, say, 18 bushels. Before it is possible to find out how much this property is worth to the prospective buyer, it is necessary to draw up a kind of imaginary balance-sheet, showing expected receipts from the property and expected expenses, so that an estimate can be made of the additional income which will accrue to the buyer if he decides to purchase the property.

Not many farmers or other intending purchasers are familiar with this procedure and, to provide an example which can be adapted to different local conditions, two imaginary balance-sheets are given below. One is for a hypothetical wheat-sheep property in the western slopes of New South Wales and the other one for an imaginary dairy farm on the north coast outside the Milk Zone.

It must be stressed, however, that neither of these examples should be regarded as giving indications of the actual amounts which it is reasonable to pay for agricultural and dairying lands respectively. What is attempted here is to demonstrate one procedure by which the income-producing capacity of a given farm can be arrived at. It must be again stressed, however, that the actual amounts which are arrived at, depend not only on the purchaser's judgment with regard to the physical productivity of the farm, but also on his judgment with regard to the future level of prices. The actual figures used here should not be regarded as an attempt to assess the value of an "average wheat" or "average dairy" farm.

In the purchase of agricultural land it is not possible to eliminate this element of judgment. Farms are mostly bought as long-term investments—as places on which the purchaser may live and work for many years. Also, the initial investment made will only repay itself over many years, unless the farm is resold at an earlier date. The yield on the capital investment should therefore be estimated on the longest possible period ahead, say fifteen years.

Prices of most primary products fluctuate very violently, and few persons would confidently predict the price of a farm product more than two or three years in advance. Hence this estimate of the average price of a product for, say, the next fifteen years is very largely a matter for the judgment of the buyer. To work out the returns in the examples quoted below, the following average prices will be assumed to rule over the next fifteen years:—

Wheat, 4s. 9d. a bushel at sidings (bulk basis).
Wool, 1s. 6d. a lb.
Fat lambs, £1 each; stores, 15s. each.
C.F.A. Merino ewes, 10s. each.
Replacement breeding ewes (2 T's), 25s. each.
Butter, 1s. 9d. per lb.
Culled cows, £6 per head.
Pigs (baconers), £5 per head.

It will be noticed that these prices are considerably below current prices. These lower prices are used because it does not seem likely that prices will remain at present levels. However, it may well be that the prices given below are too low—or again they may be too high. As already stated, nobody can give a farmer or other purchaser an accurate guide as to the fifteen year average price of the products listed above. It must be again emphasized that these prices are used here solely for the purpose of working out two hypothetical farm budgets, and that they should not be regarded as either official or unofficial forecasts of prices.

Determination of Value Productivity.

I. A Wheat and Sheep Farm.

We can now take our first example—a mixed wheat-sheep property in the western slopes district of New South Wales, of 1,000 acres of agricultural land with an 18 bushel average wheat yield.

The following additional assumptions with regard to farm plant and cost of equipment are made; 300 acres are sown annually to wheat after fallow; 150 acres of oats for grazing are sown on stubble; 60 lb. of superphosphate are used per acre of wheat and 30 lb. per acre of oats; 500 Merino ewes are joined for the production of 375 crossbred lambs; all lambs are sold and ewes are replaced after four lambs; 134 young ewes (2 T's) and 2 rams will be purchased annually.

It is estimated that the following amounts will have to be spent to obtain initial plant and stock:

Plant.	£
Tractor	750
Disc plough	100
Scarifier	100
Combine	150
Harrows	40
Header	400
Motor lorry	750
Reaper and binder	160
Chaffcutter	50
Miscellaneous	100
Total value of plant	2,600

Stock.	£
500 breeding ewes at £2 5s. od.	1,125
10 rams	75
1 hack	20
Total value of stock	1,220

The value of structures on the property in question is estimated as follows:

	£
House	1,000
Fencing	400
Farm buildings	200
Water supply	100
Total value of structures	1,700

Annual sales will total 5,300 bushels of wheat (total production will be 5,600 bushels; 300 bushels are estimated to be retained on the farm as seed). Annual sheep losses are put at 5 per cent., leaving 475 ewes shorn annually, producing 4,275 lb. of wool (at 9 lb. of wool per head). Also 225 lambs will be sold as fats and 150 as stores, and 110 C.F.A. ewes will be sold.

On the basis of the prices given earlier, average annual gross receipts from this property will be:

	£
Wheat—5,300 bushels at 4s. 9d. per bushel	1,259
Wool—4,275 lb. at 1s. 6d. per lb.	321
Lambs—225 at £1 each	225
150 at 15s. each	112
Ewes—110 C.F.A. ewes at 10s. each	55
Average annual gross receipts	1,972

Expenses on this imaginary property are estimated as follows:

(*a*) *Cash Expenses*—

	£	£
(1) Cropping Expenses—		
Labour (bag sewing, etc.)	50	
Bags (bulk basis to last three years)	42	
Twine	6	
Fertiliser	68	
Fuel, oil and grease (300 acres at 10s.; 150 at 3s.)	172	
Repairs	50	
Cartage to rail (6d. per bag)	45	
		433
(2) Sheep Expenses—	£	
Shearing and dipping at 1s. 3d.	30	
Woolpacks, drenches, oil, etc.	15	
Freight and selling at 1¼d. per lb.	22	
Flock maintenance:—		
134 ewes at 25s.	168	
2 rams at £7 10s. od. each	15	
		250
(3) General Expenses—	£	
Maintenance of structures at 1½ per cent.	10	
Rates and taxes	20	
Truck expenses on property	35	
Insurance	25	
Miscellaneous	30	
		120
Average annual cash costs		803

(*b*) *Non-cash Costs*—

	£
Operator's labour	350
Depreciation, plant (10 per cent.)	260
Depreciation, structures (1½ per cent.)	10
Interest at 5 per cent. on plant and stock	191
Average annual non-cash cost	811
Average annual total costs	1,614

Thus the average annual return attributable to property is £358.

Having arrived at this figure we can obtain the value of the property to the purchaser. Interest rates allowed by the various Cost of Production Committees are usually around 4½ per cent. Interest rates on bank overdraft are also 4½ per cent. It will be assumed here that the purchaser is only interested in buying the property if it returns him 5 per cent. If the purchaser is willing to take a lower rate of return, the price he would be prepared to pay would increase, but the method of arriving at the final figure would be the same.

On the assumption a net return of 5 per cent. is required, we find that if

$$5 \text{ per cent.} = £358, \text{ then}$$

$$100 \text{ per cent.} = \frac{358 \times 100}{5}$$

$$= £7,160.$$

In other words the purchaser would be willing to pay £7,160 for the property including farm buildings and improvements (but excluding the house)—or approximately £7 3s. per acre. Including the house he would be prepared to pay £8,160 or approximately £8 3s. per acre.

It will be noticed that in the above calculation of farm expenses, no allowance is made for either maintenance or depreciation or interest on the value of the house, which is not a farm expense but a household expense, and should therefore not be taken into account in the farm budget.

II. A Dairy Farm.

The second example which will be worked out is an imaginary balance-sheet for a dairy farm of 150 acres on the north coast outside the Milk Zone. It is assumed that this farm has a carrying capacity of fifty cows and 25 head of supporting stock (heifers and

calves). Normal losses each year may be put at 25 per cent. each year, or twelve cows per annum. It is also assumed that ten of these are sold annually and that the farmer grows all the feed required on the property. In terms of butter production the average annual capacity of the farm is estimated at 10,000 lb. of butter and in addition five breeding sows will be kept to utilise skim milk. A small quantity of potatoes or vegetables is sold annually. On such a farm a considerable amount of family labour will have to be used, and an allowance of £200 per annum is made for remuneration of part-time labour at award rates.

It is estimated that the farm carries the following buildings and improvements:

	£
House	1,000
Sheds	200
Dairy bails, etc.	350
Piggeries	100
Fencing	250
Value of building and improvements	1,900

Estimates of the value of plant and stock which will have to be bought to run the farm at capacity are given below:

Plant.

	£
Disc plough	30
Cultivator	30
Mower	60
Diamond harrow bar	10
Chaffcutter	35
Fertiliser broadcaster	50
Hayrake	25
Springtooth cultivator	40
Feedgrinder	20
3-unit Milking machine	180
Separator	60
Boiler and fittings	35
Miscellaneous (cans, harness, etc.)	110
Utility truck	600
Value of plant	1,285

Stock.

50 cows at £15	750
12 heifers at £10	120
13 calves at £6	78
1 bull	30
5 breeding sows at £6	30
1 boar	7
4 draught horses at £15	60
1 light horse	15
Value of stock	1,090

Average annual gross receipts on this farm are estimated as follows:

	£
10,000 lb. of butter at 1s. 9d. per lb.	875
10 culled cows at £6	60
60 baconers at £5	300
Miscellaneous receipts (from bull, calves, vegetables, etc.)	25
Average annual gross receipts	1,260

An estimate of expenses on this farm is given below:

(1) *Cash Expenses—*

	£
Seed	5
Fertiliser	15
Fuel and power	50
Maintenance of structures at 1½ per cent.	14
Maintenance of machinery	50
Insurance	10
Rates and taxes	20
Miscellaneous	30
Average annual cash expenses	194

(2) *Non-cash Expenses—*

	£
Operator's labour	350
Family labour	200
Depreciation of plant, 10 per cent.	129
Depreciation of structures at 1½ per cent.	14
Interest on value of plant and stock	109
Average annual non-cash expenses	802
Total expenses	996

The average return attributable to farm would thus be £264.

Proceeding as in the previous example, we find that if £264 is the annual return attributable to the farm, and 5 per cent. is regarded as a "reasonable" return on capital investment, then the capital value of the farm will be £5,280, including farm buildings and improvements, but excluding the house, or £35 4s. per acre. If the house is included the total value of the farm is £6,280 or approximately £41 17s. per acre.—F. H. GRUEN, Economics Research Officer.

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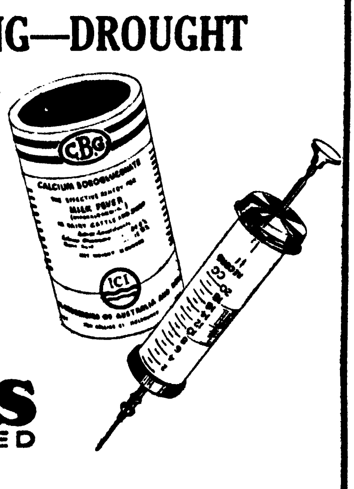

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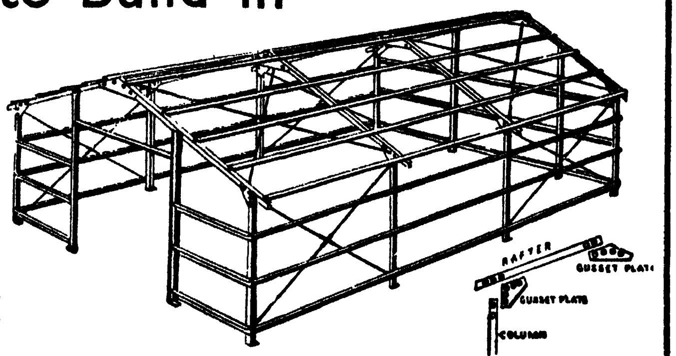

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THE NEW INTERNATIONAL WHEAT AGREEMENT

UNLIKE the 1948 agreement the International Wheat Agreement reached in Washington in March of this year has been ratified by a sufficient percentage of the contracting parties to ensure that it will come into force. It was the intention of the contracting governments that the agreement should operate from 1st August, 1949, and the agreement itself specifies that it shall operate from that date, with the exception of the sections relating to price and quantity which may operate from 1st August, and must operate not later than 1st September, 1949.

In view of the fact that over 80 per cent. of the exporting parties to the Agreement (in fact all the major exporters), and over 70 per cent. of the importers ratified the Agreement by the date originally specified, it is probable that transactions under the Agreement will commence on 1st August. It may not be possible, however, to make a final allocation of quantities until towards the end of the year, in view of the fact that all parties to the Agreement have not yet ratified. Others are expected to ratify later and the date for ratification has been extended to 1st October, 1949.

The 1949 International Wheat Agreement then, is likely to be the only International Wheat Agreement, with the exception of the 1933 Agreement (which broke down in less than twelve months), to prove effective; although whether it will remain effective for its full period of four years, in view of the absence from the agreement of one major exporter (Argentina) and one potentially large exporter (U.S.S.R.), is open to some doubt. In addition there is no means of enforcing contracting parties to fulfil their contracts under the Agreement; complete reliance is placed on the integrity of the participating countries.

However, as this Agreement, if it proves effective, will have an important bearing on the fortunes of the Australian wheatgrower and the Australian economy in general, it is worth examining the main clauses of the Agreement and comparing them with the 1948 Agreement.

Effect on the Stabilisation Scheme.

The new agreement will have no immediate effect on the stabilisation scheme. It will, however, generally consolidate the position, making it less likely that the stabilisation fund will have to be drawn upon to maintain the guaranteed price on export wheat. This means, of course, that, in the long run, it should be of direct benefit to the grower, in that his contributions to the fund will be returned at a later stage, or at least a greater portion of them will be returned than would otherwise have been the case. The Commonwealth Government is also less likely to be called upon to contribute to the maintenance of the guaranteed price, and it should not be necessary to maintain such a large reserve in the stabilisation fund as it would if the Agreement were not operating. On the other hand, it would be unwise to place complete reliance on the Agreement running its full term without any hitch, due to the reasons already mentioned.

Is the Agreement Necessary?

Will the Agreement prove beneficial to the Australian wheatgrower? That is a matter which has been debated very strongly in Australian wheatgrowing circles, and it is a question which it is not at all easy to answer. However, it does appear very likely that the gradual fall in wheat prices, which has been proceeding for about twelve months, will continue during the period of the Agreement unless one or two very adverse seasons are experienced in the Northern Hemisphere wheat-producing countries during the next three years.

The United States of America is again harvesting a very large crop, although recent adverse weather has caused official estimates to be reduced by nearly 200 million bushels from the earlier figure of 1,300,000,000 bushels. But even with this reduced production and somewhat smaller crop anticipations in Canada and Europe this year than in 1948, the United States is likely to have a substantial surplus of wheat available during the current crop year—and this cannot but

have an adverse effect on prices unless some other factor, unforeseen at present, operates as a counter.

Nevertheless, the fall in prices may not be as great as has been suggested in some quarters overseas, but it does seem quite possible that the open-market price for wheat may fall below the maximum fixed in the International Agreement, even during the first year of that Agreement's operation. If the Northern Hemisphere continues to experience satisfactory seasons in 1950 and 1951, it seems very likely that wheat prices will fall well below the maximum price in the later years of the Agreement. Whether, on the other hand, prices will fall to the minimum levels set in any of the four years, 1949/50 to 1952/53, only experience will show. It is impossible to forecast trends in world wheat prices over a period of four years but, on present indications, it does appear likely that Australian wheatgrowers, will be reaping very definite benefits from the Agreement before its expiry in four year's time.

The Terms of the Agreement.

Quantities.

The five exporters—the United States, Canada, Australia, France and Uruguay—have agreed to supply the quantities of wheat set out below at certain minimum prices in each of the next four years, commencing probably on 1st August and not later than 1st September, 1949. The United Kingdom, Italy, India, the Netherlands and thirty-two other countries have agreed to purchase certain quantities of wheat at a fixed maximum price in each of the next four years. Wheat over and above the alloted quotas may be sold freely at the ruling market price.

The quantities originally guaranteed by the exporting countries were as follows:

	1949 Agreement (Thousand bushels)	1948 Agreement (Thousand bushels)
Australia ..	80,000	85,000
Canada	203,070	230,000
U.S. of America	168,070	185,000
France	3,306	—
Uruguay	1,837	—
	456,283	500,000

These quotas are subject to re-adjustment should all parties not ratify the Agreement and, as Paraguay did not sign the Agreement and Peru reduced her commitment prior to signing, the total quantity involved will be reduced to at least 452 million bushels unless some other importers agree to increase their quotas. As it is probable that a few countries will not ratify, it is likely that the final quotas allocated exporting countries will be slightly lower than the figures shown above; any reduction is likely to be on a pro-rata basis. There are provisions for modifying exporters' and importers' quotas in the event of a short crop or other exceptional circumstances.

The Price.

Prices are fixed in Canadian currency (at the time the Agreement was signed the Canadian dollar was of the same value as the U.S. dollar) and are for No. 1 Manitoba Northern Wheat, in store Fort William/Port Arthur. The maximum price in each year is $1.80. The minimum price in the first year $1.50 and falls by 10 cents each year to $1.20 in the fourth year.

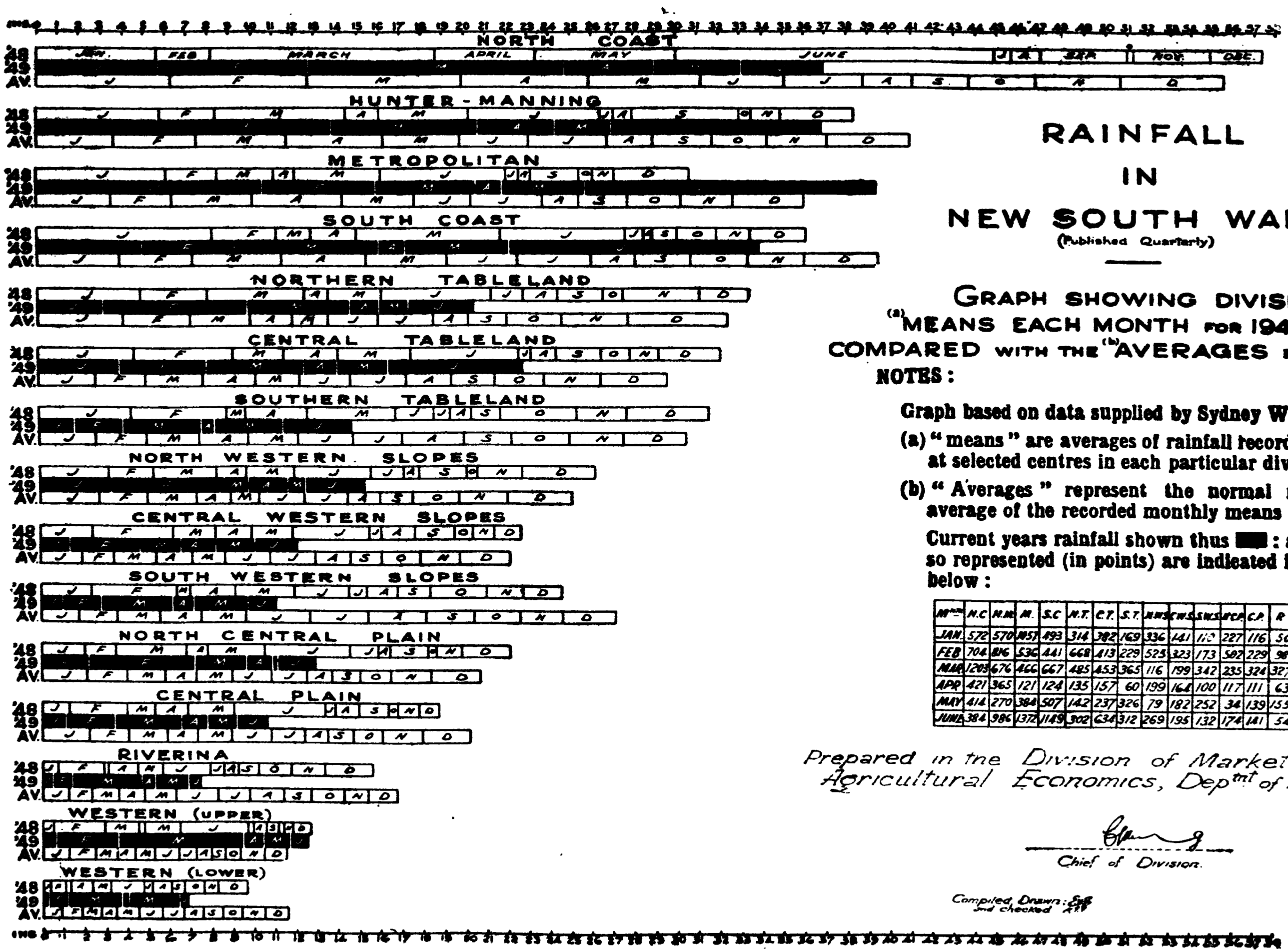
Maximum and minimum prices in the 1948 and 1949 Agreements are compared in the following table:

Year.	Minimum Price.		Maximum Price.	
	1948.	1949.	1948.	1949.
	$	$	$	$
1948–49 ...	1·50	...	2·00	1·80
1949–50 ...	1·40	1·50	2·00	1·80
1950–51 ...	1·30	1·40	2·00	1·80
1951–52 ...	1·20	1·30	2·00	1·80
1952–53 ...	1·10	1·20	2·00	1·80

It will be noted that although the maximum price is 20 cents lower than in the 1948 Agreement the minimum price is 10 cents higher.

In Australian currency, at present exchange rates, the equivalent maximum price will be approximately 11/-, but this price will vary slightly depending upon the proportion of the crop sold to India and other near-Eastern markets (in which the grower will receive a slightly higher return when the price is at the maximum level), and to the United Kingdom. The destination of the wheat sold will not effect returns when prices are at the fixed minimum.

(Continued on page 418.)



RAINFALL IN NEW SOUTH WALES

(Published Quarterly)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1948 AND 1949 COMPARED WITH THE (b) AVERAGES FOR PAST YEARS.

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "Averages" represent the normal rainfall or an average of the recorded monthly means since 1911;

Current years rainfall shown thus ▇▇ : and the figures so represented (in points) are indicated in the schedule below :

Mth.	N.C	H.M.	M.	S.C	N.T.	C.T.	S.T.	N.W.S.	C.W.S.	S.W.S.	N.C.P.	C.P.	R	W.U.	W.L.
JAN.	572	570	1057	493	314	382	169	336	141	[illegible]	227	116	50	66	34
FEB	704	816	536	441	668	413	229	525	323	173	582	229	98	295	88
MAR	1203	676	466	667	485	453	365	116	199	342	235	324	327	583	249
APR	421	365	121	124	135	157	60	199	164	100	117	111	63	97	35
MAY	414	270	384	507	142	237	326	79	182	252	34	139	155	130	245
JUNE	384	986	1372	1149	302	634	312	269	195	132	174	141	54	85	38

Prepared in the Division of Marketing and Agricultural Economics, Depᵗ of Agriculture

Chief of Division.

Compiled, Drawn: and checked

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Condobolin .... August 9, 10
Trundle .... August 16, 17
Weethalle (P. G. Ussher) .... August 17
Bedgerabong .... August 20
Wagga Wagga (G. O. Dewey) . August 23, 24, 25
Wentworth (S. Clifford) .... August 24
Peak Hill .... August 26, 27
Parkes .... August 29, 30, 31
Grenfell .... September 2, 3
Young (T. A. Tester) .... September 6, 7
Forbes .... September 9, 10
Cowra .... September 13, 14
The Rock (O. L. Boyd and A. F. Walker .... September 17
Canowindra .... September 20, 21
Eugowra .... September 27, 28
Leeton (E. C. Tweedie) .. September 30, October 1
Albury (A. G. Young) .... October 11, 12, 13
Kyogle .... October 12, 13
Lismore (North Coast National) October 19, 20, 21, 22
Alstonville .... October 27, 28
Murwillumbah .... November 2, 3
Mullumbimby .... November 9, 10
Bangalow .... November 16, 17
Nimbin .... November 24, 25

1950.

Paterson (S. M. Reynolds) .. February 9, 10, 11
Newcastle (P. G. Legoe) February 22, 23, 24, 25
Dorrigo (H. S. Doust) .... February 24, 25
Gundagai (J. C. Sattler) .... March 7, 8
Dungog (M. Riordan) .... March 24, 25

Approved Vegetable Seed, August, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear the number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (H.B. 49/5)—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Pearson (Moscow) (H.R. 47/6 and H.R. 48/1) —H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 47/2)—H. P. Richards, "Sovereignton," Tenterfield.

THE *Agricultural Gazette* is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.

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TESTING BANANAS FOR SALICYLANILIDE*

Suitable Field Technique Developed

D. K. O'NEILL, A.S.T.C., A.A.C.I., Analyst.

DURING 1948, a regulation was gazetted which makes compulsory the dipping of bananas in salicylanilide—a fungicide used for the control of "Squirter" disease of the fruit—between the 1st May and 30th November each year. In order to make this regulation effective, it became necessary to have some means of detecting whether or not bananas marketed in New South Wales had been dipped in a salicylanilide preparation.

A test which, when applied to the skins of bananas, enables the detection of the presence of salicylanilide deposited there as a result of dipping, has been developed, and is described in this article.

This test is a simple one which can be performed under field conditions, at the markets, loading points and in packing sheds, with the aid of a small kit of apparatus and reagents.

The test is a colourimetric one, depending upon the reaction of salicylanilide with 4-amino-antipyrine in the presence of potassium ferricyanide in alkaline solution, to form a red antipyrine dye.[1]

As little as 10 micrograms (10 millionths of a gram) of salicylanilide can be detected in the laboratory, and the colour produced by 30-40 micrograms of salicylanilide can easily be detected by the eye under field conditions.

* Salicylanilide is the active ingredient in "Shirlan" and similar proprietary products.

The Kit Required for Field Testing.

The test can be performed in the field with the following kit of apparatus and reagents:—

Kit of Apparatus and Reagents.

1. Cotton wool—2-3 oz.
2. Reagent A—acetone—½ pint.
3. Reagent B—sodium carbonate, 0.045 per cent. solution—5 pints.
4. Reagent C—4-amino-antipyrine, 2 per cent. aqueous solution, contained in a small dropping bottle—50 ml.
5. Reagent D—potassium ferricyanide, 4 per cent. aqueous solution, contained in a small dropping bottle—50 ml.
6. Glass bottles with stoppers and wide mouths, 2 fl. oz. capacity with a graduation mark at the 1 fl. oz. level—6 bottles.

Field Kit Used for Testing Bananas for Salicylanilide Dipping.

The salicylanilide on the skin of the banana is being removed by swabbing with a pad of cotton wool wetted with acetone.

Testing Procedure.

The following is the procedure for making the test:—

1. Swab the exterior of a few bananas selected with a small pad of cotton wool moistened with Reagent A.
2. Place the swab in test bottle.
3. Add Reagent B to the 1 fl. oz. mark.
4. Add 10 drops of Reagent C.
5. Stopper bottle and shake thoroughly.
6. Add 10 drops of Reagent D.
7. Stopper bottle and shake thoroughly.
8. Observe colour produced after a few minutes' standing. Pink to red indicates that salicylanilide is present. Green to yellow indicates that salicylanilide is absent.

The quantities of reagents quoted are sufficient for 100 tests. To reduce the size of the kit, a smaller quantity of reagent B could be carried. It has been found that the reagents are stable for a considerable period of time, if the solutions, when not in use, are kept in a box so as to avoid undue exposure to sunlight.

Provided the procedure outlined above is followed, and that the reagents are checked from time to time by performing the test with both dipped and undipped bananas, and also that the test bottles are rinsed with water between tests to avoid contamination from any previous test, no difficulty should be experienced in conducting the test in the field.

Recent Test Experiences.

With the aid of a field kit, tests for salicylanilide dipping of bananas were recently made at Murwillumbah in growers' packing sheds and at the railway loading point. In each instance, where cases were branded "Shirlan-treated," positive reactions were obtained.

Bananas selected from the first, middle and last cases of a 40-case consignment which had been treated in the one dip in a growers' packing shed gave similar colour intensities.

By applying the test to various parts of the bananas it was observed that, owing to tight packing in the case, the sides of the fruit were not always wetted by the dip to the same extent as the ends. It is possible to overcome this by sousing the case several times to remove airlocks and by allowing at least one minute dipping time.

The presence of DDT, benzene hexachloride, copper and sulphur compounds does not interfere with the test. As the test gives positive reactions with some phenolic compounds, some wetting agents give colours with this reaction, but in practice their concentration is too low to interfere.

The concentrations of the reagent solutions, with the exception of Reagent B (sodium carbonate solution), are only approximate. It is necessary to have the sodium carbonate solution as close to 0.045 per cent. as possible.

The 4-amino-antipyrine, which was not obtainable from the commercial houses, was prepared from antipyrine[2] in the Chemist's Branch for this investigation. The other reagents are readily available.

Acknowledgments.

The writer wishes to express appreciation to Mr. H. W. Eastwood, Special Fruit Officer (Tropical Fruits), and to Mr. G. Jeater, District Fruit Officer, for their co-operation in arranging field trials of this test and for making available bananas for its development.

References.

[1]GOTTLIEB, S., and MARSH, P. B.—*Ind. & Eng. Chem.* (*Anal.*); 18, 16-19 (1946).

[2]EMERSON, E. J.—*J. Org. Chem.*: 3, 153 (1938).

Protect Your Fruit Trees from Rabbits.

IN many fruit-growing districts of the State, rabbits are reported to be causing considerable damage to fruit trees. Not only young trees are being attacked, but in many cases old trees also are being injured to such an extent that many are likely to be killed.

In the absence of sufficient supplies of wire netting, the following mixture is recommended by the Division of Horticulture for painting on the trunks of trees to prevent rabbits from eating the bark:—

1 oz. bitter aloes.
1 lb. common soap, cut up fine.
1 gallon water.

The ingredients should be boiled for about twenty minutes, and when cool applied with a brush or swab to the butts of the trees to a height of about 2 feet 9 inches from the ground.

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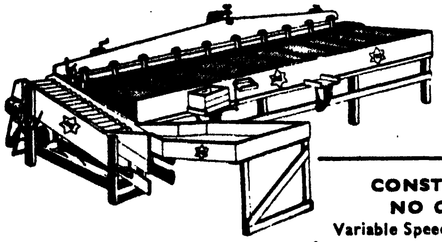

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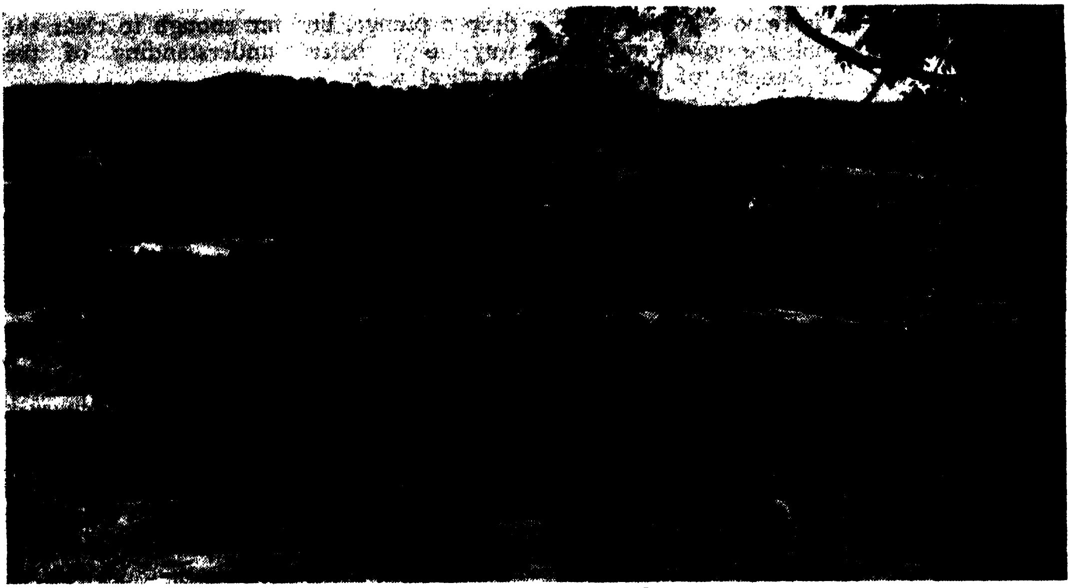

Citrus Orchards in the Gosford District.

FRUITGROWING

CONSERVATION MANAGEMENT OF CENTRAL COAST CITRUS ORCHARDS

(*Continued from page* 361.)

K. D. McGILLIVRAY, H.D.A., Fruit Officer.

IN the first portion of this article—which appeared in the July issue—it was shown that what may, at first, have seemed to be a sensational statement suggesting insecurity in the coastal citrus industry, is actually founded on fact. In this and subsequent issues it is proposed to show that soil, soil moisture, water and plant nutrients can be conserved, not only for the use of the next generation, but also to the better profit and satisfaction of those now occupying the land.

This will be done by a series of practical suggestions as to how to maintain tree productivity. The maintenance of fertility in the soil is of no value if there is insufficient moisture in the soil to allow the trees to make use of the plant foods, or to produce only second crop fruit.

A Conservation Programme.

There are two lines of defence in a conservation programme of citrus orchard management—cultural practices and mechanical measures. Cultural practices to be considered include cover crops, tillage, mulches, irrigation and windbreaks; mechanical measures include contour planting, graded drainage banks and waterways.

Practically all established orchards on the central coast are square-planted; protection against soil erosion in these orchards is difficult, and full efficiency cannot be expected from a programme of cultural practices designed to effect conservation. However, even with the permanent hurdle of square planting good cultural management can save soil and help to keep up fertility.

When this hurdle is removed, as it is on the new orchards which are now being contour planted, the full benefits of conservation are available. However, on many of the new orchards on the coastal highlands which are being square-planted bigger and better soil scoops than ever before are likely to be wanted to bring back the soil because slopes are generally steeper than on the established sites. Some of the areas planted

Navel Oranges, Mangrove Mountain District.

to citrus trees recently in different parts of the district are so steep that they are only suitable for native trees or perhaps grass.

Contour planting and graded drainage banks are essential for full success with conservation management. By their use storm water is compelled to "walk-off" instead of run off the cultivated orchard land. When water leaves the cultivated land, its safe conduct downhill to a well-covered watercourse or other safe disposal area completes the control programme.

The important, but often neglected, subject of water-disposal is the first item for detailed consideration in any soil conservation programme but before discussing it a plunge into the principles of the control of water erosion of soil is proposed—not too deep a plunge, but far enough to clear the way to a better understanding of the practical work.

Rainfall, Run-off and Soil Erosion.

It should be realised that what is often disregarded as "text-book information," is, in agriculture, the recorded results of many years of investigation and hard work in the field. Combined with practical experience in other places this information must be the starting-off point of new work in a new region. The practical demonstration of a new technique in a new region is the application of this knowledge to the soil where it is tested and perhaps modified to suit the new conditions. Practical work has been done and is still being done on the central coast, based on the "theory" of water disposal.

The term "run-off," simple and descriptive, is used to describe the excess rain water which drains off the surface soil and is seeking the shortest and quickest way to the ocean. Management of this water is packed with problems of the control of soil erosion.

Cleared and tilled land offers little resistance and soil goes with the running water. The water is delayed in bushland by litter on the surface, and the soil is held together by the roots of trees and bush plants. The amount and rate of run-off is affected by: (1) Characteristics of the land on which rain falls; (2) characteristics of the rainfall.

The Land as it Affects Run-off.

The steeper the slope, the less rain soaks in, and the faster the run-off. Long slopes, even on moderate grades, cause great amounts of water to accumulate as run-off. Soils vary in their ability to take in water. For example, coastal highland citrus soils take in water readily, but when water runs downhill over a bare surface they wash away easily with little resistance because they lack binding materials. Run-off is increased from badly drained soils because of their resistance to the penetration of water. Seepage areas—known as "wet spots"—which occur on coastal highland slopes add to the volume of run-off and so contribute to the erosion of land below them.

Unfortunately no exact information is available as to the proportion of run-off to be expected from different soil types on

different slopes. The Soil Conservation Service accepts an estimate of 50 per cent. on fallowed land. This can be accepted for sandy citrus soils under clean tillage.

When plants are growing on the soil surface they break up raindrops, spread water and delay run-off. Chopped-up plant remains of cover crops, or weeds when mixed in with the surface soil, have a similar effect. Water soaks into the soil through channels left by decaying plant roots and the addition of organic matter to the soil improves absorption. Pelting raindrops on bare, cultivated soil, pack the surface and the temporary improvement of rainfall penetration by tillage is soon overcome. The mud formed by puddling on the surface tends to fill spaces in the soil and to resist penetration, and thus more run-off results.

"Heavy" Rain and "Steady" Rain.

The key to an understanding of rainfall effects is the term "rainfall intensity." Rainstorms which commonly occur on the central coast in summer and autumn are often downpours of high intensity; i.e., "heavy" rain which comes and goes quickly, but a large proportion runs off at a fast rate on the sloping orchard sites. "Steady" rains falling over longer periods do not produce the same amount of damaging run-off. Sudden summer storms of high intensity on clean tilled orchards are much feared by coastal citrus growers.

Once in every so many years a really severe storm leaves its mark on the hillside orchards. Unfortunately official and private rainfall records in the Gosford district, as in most other parts of the State, only record the daily fall. The rainstorm that lasts for, say, 10 to 20 minutes loses its identity in the daily fall. Automatic continuous recording rain-gauges are operating in capital cities, and more recently, at Soil Conservation Stations. Accurate rainfall records of this kind over many years provide a sound basis for estimating frequency of destructive storms—how often they are likely to occur.

Statistical analysis of the daily fall records is being used by Australian engineers to predict storm frequency and intensity. Mr. A. W. Miller, Soil Conservation Surveyor (*Soil Conservation Journal*, July, 1946) has used data given by Mr. F. J. McIlwraith in the *Australian Engineer*, December, 1944, and discussion by himself in the June, 1945, issue of the same journal in his design for graded banks on the western slopes. Data for Gosford show in the same articles that, once in ten years, a storm with a duration of 12 minutes and an intensity of 5.86 inches per hour can be anticipated.

Newly-planted Orange Trees on Graded Drainage Banks, Interplanted with Peas.
Mr. Talland's property, Calga (Central Highlands).

Time of Concentration.

The time that is taken for water running off all parts of a catchment area to reach the lowest part is known as the "time of concentration."

Consider this in relation to a particular orchard site. When the area was under bush it may have been 30 minutes before run-off, impeded by surface litter, could travel from the top to the bottom of the area. When the site is cleared and clean cultivated, this time might be cut down to 10 minutes. When

gullied by erosion the channels down the hill speed up the running water and shorten further the time of concentration to, say, 8 minutes.

It is a well known meteorological fact that the more violent the rainstorm the shorter the time it lasts. If by control of run-off the time of concentration can be prolonged, concentration of run-off would only occur as from a storm of longer duration—and storms of longer duration are not so violent, their rate of rainfall being less.

The obvious approach to mechanical control of run-off is to put the destructive process into reverse by prolonging the time of concentration—and that is just what the graded drainage bank does. When a severe rainstorm ceases on an area on which drainage banks have been built, water which would previously have been still rushing down the hillside, will be found running off steadily along the channels above the banks.

Measuring Run-off.

The flowing water unit in general use is the cusec (1 cubic foot per second). It so happens—a mathematical "break"—that when we know the rate of rainfall in inches per hour we also know the intensity in cusecs per acre without calculation; they are approximately the same.

As an example, consider a storm which yields 1 inch of rain in 10 minutes, equal to a rate of 6 inches per hour; this has an intensity of 6 cusecs per acre. If 50 per cent. runs off, then a rate of 3 cusecs per acre has to be dealt with as run-off.

The task is to check this water before it runs downhill far enough to move soil, and then to collect it in channels across the slope. These channels must have sufficient capacity to hold the water while it runs off steadily along them at a velocity which will not lift and transport soil.

In the example quoted above the channels across the slope of an acre of orchard (in the form of graded drainage banks) would need a total capacity of 3 cubic feet of water per second (11,250 gallons per minute).

We are, of course, dealing with probabilities in the discussion of rainfall intensity and storm frequency. Because of incomplete data and the need to anticipate there is still a seasoning of "hoping for the best" even in well-designed work of this kind. But using the data available is better than just working in the dark.

(To be continued.)

The New International Wheat Agreement—*continued from page 410.*

The minimum price in the first year is equivalent to approximately 8/9d. (Aust.) falling to approximately 6/11d. (Aust.) in the last year of the Agreement.

International Wheat Council.

The Agreement provides for the establishment of an International Wheat Council to administer the Agreement. Each importing and exporting country will have a representative on the Council. However, voting power will not be equal, but will be proportionate to the quantity of wheat to be supplied or purchased by each country.

Stocks.

Exporting countries undertake to maintain reasonable stocks of old crop wheat at the end of each crop year so as to be able to fulfil their commitments in the following year. Importing countries also undertake to maintain reasonable stocks; however, in neither case are quantities specified.

Amendments to the Agreement.

Amendments may be made to the Agreement providing they are accepted by specified majorities, while parties may withdraw from the Agreement and other countries may be accepted as parties to the Agreement, under similar circumstances.

Renewal of the Agreement.

The Agreement specially provides that consideration to its renewal shall be given by the International Wheat Council prior to 31st July, 1952.—P. C. DRUCE, Economics Research Officer.


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PLANT DISEASES

SHATTER—A VIRUS DISEASE OF TOMATOES

LILIAN FRASER, D.Sc., Plant Pathologist.

DURING mid-summer 1942-43 there was brought to notice a disease, apparently of a virus nature, which was affecting tomato plants in a crop in the Windsor District. Field surveys made during that season revealed that it was rather prevalent in the Windsor-Richmond area—in some crops affecting more than 50 per cent. of the plants. During the same season it was also seen in crops at Burragorang, Woodville and Dubbo, and in the following season at Armidale, Canberra and Maitland. Since then it has appeared sporadically in the same and neighbouring districts, but shows no signs of becoming a disease of major importance.

Affected plants are, typically, scattered throughout the crop. There is no apparent tendency to grouping or spread within the crop.

Symptoms on the Tomato.

As is the case with spotted wilt, the first symptoms appear on the immature leaves. Small, dark-brown necrotic areas of variable shape, roughly circular or angular and irregular, appear between the main veins, and necrotic streaks from less than 1 mm. to a little over 2 mm. may border the main or lateral veins (Fig. 1). Characteristically the necrotic areas are most numerous towards the base of the leaflets. Petioles of affected leaflets and the main stem adjacent to them develop necrotic streaks and blotches (Fig. 2). Brown discoloured areas occur in cortex and pith, especially at the nodes.

Two to four leaves which are immature at the time of infection develop the symptoms, and also leaves of similar age on any lateral shoots. The virus appears to die out very soon after inoculation occurs. The affected leaves continue to grow, the necrotic spots being torn open or split (Figs. 2, 3, 4), giving the mature leaf a "shattered" appearance.

Affected petioles and lengths of stem commonly grow into slightly bent or twisted permanent positions, and the streaks and blotches become slightly corky and rough.

Subsequent growth of the plant is normal, and the only results of the attack are the cluster of curled, torn leaves, the slightly distorted length of stem and the retardation consequent to the interference with normal growth (Fig. 5).

Only once have symptoms been noted on the fruit. These took the form of irregular, skin-deep necrotic blotches with some approximation to broad rings in a few cases.

Fig. 1.—Early Necrotic Lesions on Young Tomato Leaflet. Lesions towards base of leaflet are starting to tear apart.

Fig. 2.—Lesions Slightly Torn Apart as Leaf Grows After Infection Has Taken Place.
Note depressed necrotic areas on petioles.

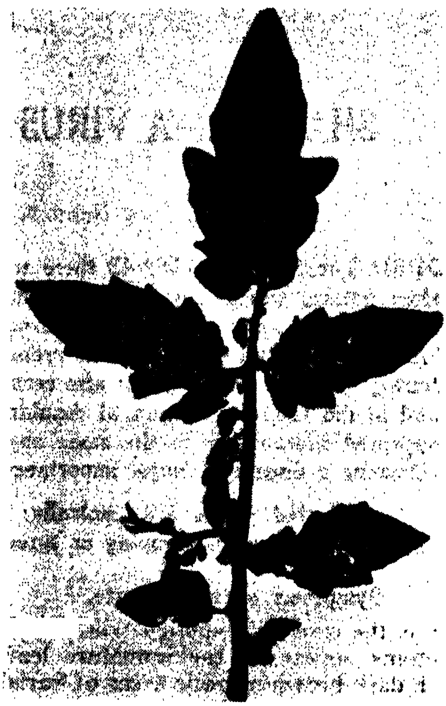

Fig. 3.—Tomato Leaf Almost Fully Grown, Following Infection.
Note curled and twisted leaflets with torn areas of original lesions.

Fig. 4.—Final Stage of Leaf Growth Following Infection.

Fig. 5.—Healthy Growth, Indicating Recovery from Infection.
Curled and torn leaves clustered around lower part of stem show where infection occurred.

Plants of any age are susceptible to attack, but as with spotted wilt, the effects are most severe on young, vigorously-growing plants.

Symptoms on Datura and Nicandra.

The solanaceous weeds *Datura stramonium* and/or *Nicandra physaloides* are common around tomato fields in the districts where shatter has been seen, and on these, very commonly, the fading leaves develop an oak-leaf pattern which shows as thin, green or necrotic brown lines against the yellow of the ageing leaf.

Transmission.

The virus is readily transmitted by grafting to tomato seedlings, from plants showing early symptoms. Axillary buds have given the best results. Symptoms develop in seedlings 10 to 15 days after grafting at normal Sydney summer temperatures.

Once an infected plant has started to make new growth it is impossible to transfer the virus from it. Apparently the virus dies out completely.

Attempts to transfer the virus by mechanical means have so far been unsuccessful, and no information on thermal inactivation point and other properties has been obtained.

Successful grafts have been made of infected tomato tissue to seedlings of *Datura stramonium*, with the production of an oak-leaf pattern on the fading leaves identical with that observed on weeds at Windsor, Maitland and Dubbo.

SCAB AND RHIZOCTONIA DISEASES OF POTATOES

The Value of Control Measures

POTATO growers are again reminded of the control measures available for common scab (*Actinomyces scabies*) and Rhizoctonia disease (*Rhizoctonia solani*).

These are:—

1. Selection of clean seed tubers.
2. Dipping of seed tubers in a disinfecting solution.
3. Crop rotation and avoidance of liming to control soil-borne attack by these diseases.

On land where soil carry-over of these diseases is negligible or non-existent, the planting of clean seed is the best method of ensuring a clean crop. It has been shown conclusively by this Department that the planting of seed tubers free of scab or rhizoctonia results in the harvesting of a higher percentage of clean tubers than does the planting of tubers affected with scab or rhizoctonia which have been dipped in a disinfecting solution. However, as it is sometimes impossible to select seed tubers 100 per cent. free of one or both of these diseases, the dipping of all seed tubers in a disinfecting solution is strongly recommended. Either the acidulated corrosive sublimate dip or an organic mercurial dip such as Aretan (0.5 per cent.) is recommended for this purpose.*

Under conditions where soil carry-over of the diseases is not a major factor in infection, dipping is effective in controlling the diseases. It is emphasised, however, that dipping does not protect tubers from soil-borne infection. In the Orange district of the Central Tablelands, for instance, an abundance of these diseases is present in the soil and, under suitable soil and climatic

Large Raised Form of Common Scab.

* If full details are required, write to the Department for Plant Disease Leaflet No. 35.

conditions in this area, a heavy soil-borne attack of scab and rhizoctonia will partially or completely nullify the effects of dipping the seed tubers.

Tuber Affected by Rhizoctonia Disease.

Rhizoctonia attack is most severe under moist, cool conditions at planting time, but injury can occur at any stage of growth. The development of the disease depends largely on weather conditions. In general, early spring plantings are more likely to suffer than late plantings.

Severity of scab attack depends on the degree of infestation of the soil with the causal organism and on the degree of soil acidity. Liming increases scab attack, and potatoes do not scab on very acid soils. Infection is greatest when the soil is fairly moist early in the season and dry over the latter part, and is generally more severe in dry than wet soils. Soil temperature is not as important as these factors, but temperatures between 70 and 80 deg. Fahr. are most favourable for scab.

Indirect control measures which should be practised under these conditions are:—

1. Avoid application of lime or dolomite immediately prior to planting potatoes. If it is desired to apply lime or dolomite to the soil, this should be done after the potato crop has been harvested and as far removed as possible from the next potato crop.

2. Practise crop rotation; plant potatoes in the same land not more than once every four years.

LEAF MOULD OF GLASSHOUSE TOMATOES

LEAF mould or mildew of tomatoes is an uncommon disease of outdoor crops in New South Wales and is rarely observed, except in seasons of abnormally high humidity, in areas other than those in the immediate vicinity of glasshouses. On the other hand, it is a major disease of glasshouse tomatoes. Beginning on the lower leaves, it progresses upwards as the plants grow and may defoliate the crop to such an extent that many of the fruits fail to develop satisfactorily.

Much can be done to reduce the severity of the disease if the glasshouses are skilfully ventilated. It should be the aim of the grower to maintain the desired degree of warmth and, at the same time, to reduce the humidity of the air as much as possible. Unless these precautions are taken, it is practically impossible to grow a successful crop under local conditions.

Ventilation, though essential, is incapable of affording the plants sufficient protection. Spraying must also be practised. Locally, best results have been obtained when fungicides containing the chemical salicylanilide have been applied to the entire plant, particular attention being paid to covering the undersurfaces of the leaves.

During an inspection of a tomato glasshouse in the Warriewood-Mona Vale district in early July, one of this Department's plant pathologists observed that many of the lower leaves of plants set out in late April and early May were affected by mould. Most growers had not then begun to spray, though many were making arrangements to commence.

Spores of the fungus survive on tomato trash and on ledges, etc., in the glasshouse from one season to the next; and it is from these spores that the disease originates each year. Shortly after infection occurs, there is a tremendous increase in the number of spores in the house and a corresponding

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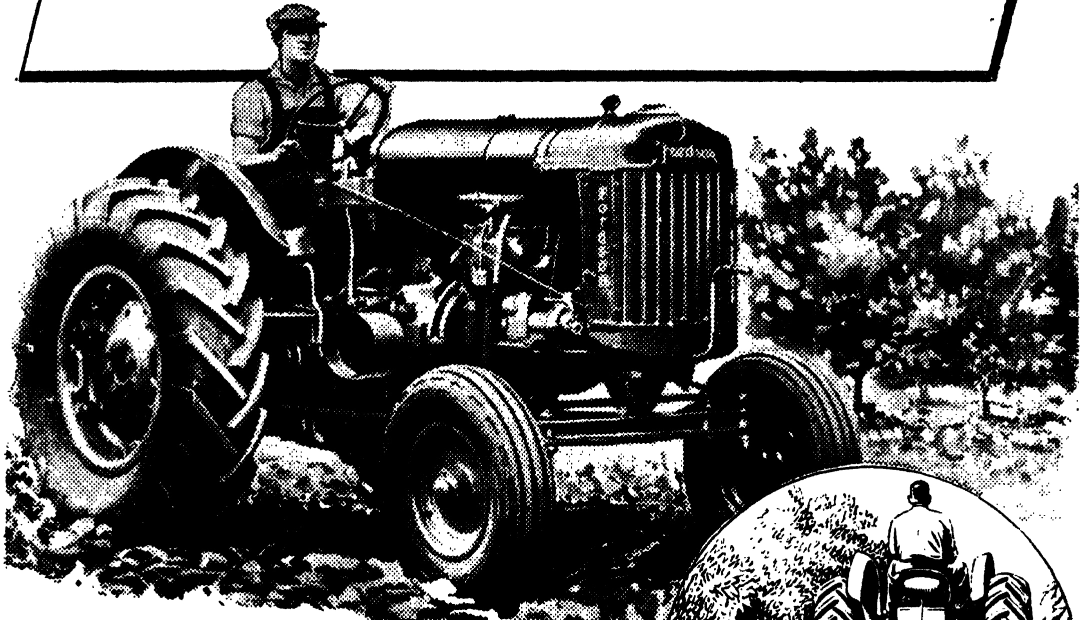

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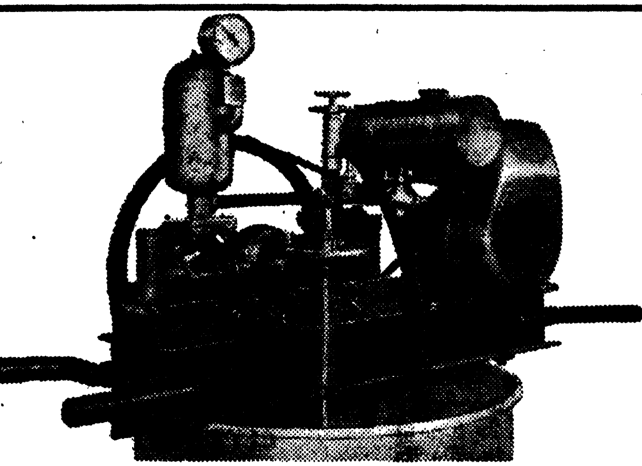

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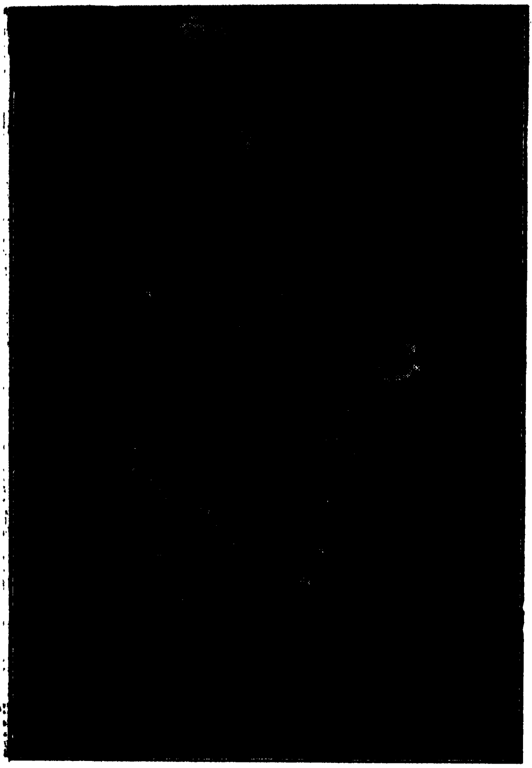

Tomato Leaflet, showing Leaf Mould in Early Stage of Development.

White downy growths appear on the under side of the leaf. At this stage, small yellowish discolourations may be seen on the upper side of the leaf. More advanced growths show a change in colour to light brown in the centre, with a surrounding margin of white downy growth.

Tomato Leaf, showing Multiple Leaf Mould Infection where the Growth of the Fungus has Changed to a Velvet, Purple-brown Colour.

At this stage enormous numbers of spores are developing on each of the patches.

increase in the number of lesions on the leaves. Once the spore load in a crop becomes heavy, the beneficial effect of spraying is seriously reduced. Thus, to be effective, the spray must be applied in the early stages of the plant's growth and be continued until the harvesting of all fruit is assured.

The attention of growers who delay spraying until the disease appears on the leaves, is directed to the Department's recommendation that spray should be applied shortly after the plants are set out and should be repeated at intervals of not more than fourteen days until the crop has matured.

Grasshopper Swarms Unlikely Next Spring.

THERE is very little likelihood of locusts reaching plague proportions next spring. Reports so far received indicate that very few locusts were in evidence last autumn, and few eggs can have been laid. Moreover, the percentage of parasitism by the Tachinid fly in later "hopper" stages and adult locusts was the heaviest on departmental record.

In addition, weather conditions during autumn and early winter have been decidedly unfavourable to the locusts. Autumn and early winter rains usually produce a heavy growth of herbage, even on the comparatively bare areas where locusts have laid their eggs. The roots of this herbage and grasses penetrate the egg tunnels in the ground, letting in moisture. The eggs then become infected by moulds and are killed out.

Everything points, therefore, to the absence of locusts next spring—unless some unforseen contingency intervenes.—ENTOMOLOGICAL BRANCH.

INSECT PESTS.

Notes contributed by the Entomological branch.

A SUMMARY OF PESTS
For the Year 1948-49*

S. L. ALLMAN, M.Sc., B.Sc.Agr., Senior Entomologist.

WEATHER conditions during the past season have been favourable for the development of various insects, usually of minor importance, which have occurred in plague or near-plague numbers. Some of the major pests (Australian plague locust, sheep blowfly, black beetle, fruit fly, etc.) have, however, been of relatively little importance. The sequence of dry or even drought years has apparently ended; the past two years have been favoured with above-average rainfall and, unfortunately, in some localities, excessive rains with serious floods have occurred.

Seasonal Conditions.

During the first half of 1948 rainfall generally was above average over the agricultural sections of the State, and in June very heavy rains fell on parts of the north coast, causing severe flooding and considerable damage. Drier conditions were then experienced until the end of the year and the rainfall was generally below average, although parts of the northern divisions and tablelands did receive more than normal rainfall.

During the comparatively dry spring, winds were stronger and more persistent than usual, particularly in the far north-west, where successive days of north-westerly winds exceeding 30 m.p.h. were experienced. Dust storms were frequent, and in mid-October practically the whole State was involved; in some localities visibility was reduced to a few hundred yards.

The year 1949 commenced with a cool, wet month with outstandingly heavy rains in the Metropolitan Area. Cool wet weather then became fairly general over the State. Floods were again experienced in March on the north coast and in the far north-west corner of the State, where unprecedented falls ranging up to 1,568 points in March at Tibooburra, were recorded. The March rainfall in the north-west corner exceeded the previously recorded rainfall for any complete year. Comparatively dry, cool conditions were general for the following months until June, when very heavy flood rains caused considerable losses to vegetable crops, orchards and homes in the Hunter, Warragamba and Nepean valleys.

Frost damage was very general throughout the State and crops of other varieties were damaged. The season commenced with a notably cold spell in mid-July, during which snow was reported to have fallen in the Metropolitan Area. Pea crops were affected throughout the State, particularly in the Picton and Camden districts. Cabbages were also affected in the Moss Vale and Central Coast areas, thus affording an indication of the unusual severity of the July frosts. Later frosts caused damage to beans in the Camden and Campbelltown areas and to canning peas in the Cowra district.

* Compiled from reports and information submitted by officers of the Entomological Branch.

Heavy losses in citrus fruits occurred along the Murray River, in the Murrumbidgee Irrigation Area, and to a lesser degree in the coastal areas. A poor setting of pome fruits, particularly in the Batlow and Orange districts, was also considered to be due to late frosts. In October, heavy frosts occurred on the Northern Tableland and caused damage to nearly all fruit crops, very few orchards escaping losses.

Frost damage to wheat was fairly general and was particularly severe in the north-west where some individual crops yielded only slightly more than half the estimated harvest. Losses on the same general scale, but to a lesser degree occurred in linseed, a supposedly frost-resistant crop, the main damage again occurring in the north-west.

Pasture and Field Pests.

Plagues of army worms (*Cirphis unipuncta*) were reported early in the season from the Richmond and Clarence River districts from pastures which had been previously flooded. Plagues also developed later in the central and south coast areas and caused considerable losses of saccaline and maize. The army worms apparently bred up on the very lush growth produced by the heavy and consistent summer rains.

The Heliothis moth (*Heliothis armigera*) was in evidence during the spring months on linseed and again in the summer on tobacco crops grown in the northern section of the State. Linseed is an important and relatively new crop which is now being grown on a large scale, some 8,000 acres being planted in the State this season. Some heavy infestations of *Heliothis* developed in the north-west, where approximately 6,000 acres of linseed were concentrated, and in spite of dusting with DDT, made difficult by a period of almost gale-force winds in October, crop losses ranging from 10 to 25 per cent. were not unusual. Even heavier infestations developed in the central-west and total failures were seen. Regular falls of rain every two to three weeks in the tobacco-growing areas in the north of the State encouraged the regular emergence of moths from pupae in the soil and the budworm (*Heliothis armigera*) was more than usually troublesome. This moth also caused losses in lucerne crops about Coolah.

Possibly the most evident insect plague was the spring infestation of black aphids which covered the main northern sections of the State, and in addition to plant injury, caused annoyance by smearing windscreens and duco of travelling cars. The aphids developed primarily on the abundant growth of clovers and trefoils, and distribution was aided by the persistent winds in October. The aphids consisted mainly of *Aphis gossypii,* but also included a complex of several, as yet, undetermined species of *Aphis*. The widespread aphid infestation, coinciding with the relatively dry spring, was responsible for a considerable curtailment of the bean crop. These aphids settled on a wide variety of other crops and caused serious injury to cucurbits, peas and carrots. The aphid flight was followed in a few weeks by the appearance of large numbers of hover flies (mainly *Xanthogramma grandicorne*) and ladybirds (mainly *Coccinella repanda* and *Leis conformis*). These predators were probably mainly responsible for the sudden end of the aphid plague.

The Australian plague locust (*Chortoicetes terminifera*) was troublesome only in the Hunter River outbreak area where a control campaign was necessary. Lush growth, following excellent rains, minimised losses, and the outbreak came to a speedy end. The small plague grasshopper (*Austroicetes cruciata*) caused some damage to pastures in the Darlington Point, Deniliquin, Berrigan and Finley districts, but losses were not great. The wingless grasshopper (*Phaulacridium vittatum*) caused damage in the Batlow district by stripping the leaves off currant bushes, but was otherwise of no consequence.

The black beetle (*Heteronychus sanctae-helenae*) has not been much in evidence except on the Clarence River, where masses of adult beetles were concentrated in patches by flood waters. The usual troubles in lawns and greens were experienced in the Metropolitan Area, but the beetle was definitely below normal as a crop pest along the coast as a whole.

Red-legged earth mites (*Halotydeus destructor* and *Penthaleus major*) caused considerable damage to clovers, young lucerne, linseed and vegetable crops in the

southern portion of the State and control measures, employing DDT, had to be undertaken.

The pasture scarab (*Aphodius howitti*) was generally active in the southern and central tablelands and caused considerable damage to lawns and golf fairways.

Fruit Pests.

The plague thrips (*Thrips imaginis*) occurred in numbers aproaching pest proportions in most fruitgrowing districts, and was considered by many growers to be responsible for a poor setting of pome fruits. Late frosts occurred in some of the localities particularly concerned, *e.g.*, Batlow, Orange, Yetholme, and it is by no means certain that thrips were actually responsible for the damage.

Fruit flies (*Strumeta tryoni*) were troublesome for limited periods only, and the total loss was not great. Infestation of Valencia oranges in the Gosford district was more extensive than usual, largely due to the late holding of the crop for more favourable marketing and conditions favourable for fly activity.

Light fruit-fly infestations were recorded from a number of inland localities, including Forbes, Orange, Dubbo, Narromine, Hillston, Griffith and Quirindi. A light infestation of bananas was also recorded from the north coast. Queensland fruit fly was bred from both tree strawberry (*Arbutus unedo*) and the Himalayan strawberry (*Benthamia fragifera*), and these constitute new host records.

Scale infestations built up more than usual, probably both as a result of favourable weather conditions and the use of DDT for the control of other pests.

Yellow scale (*Aonidiella aurantii*), purple scale (*Lepidosaphes beckii*) and brown scale (*Saissetia oleae*) were all more noticeable in the Gosford district, while white wax (*Ceroplastes destructor*) increased very substantially. A feature of the white wax scale increase was the high proportion of young scales which successfully settled on the twigs and completed their full development. In the Murrumbidgee Irrigation Area an appreciable build up of red scale (*Aonidiella aurantii*) occurred during the mild summer months, but "crawler" production was reduced to a low level by the frosts in May.

The continued use of DDT on apples and pears has reduced codling moth (*Cydia pomonella*) populations to a minimum, but has been followed by red spider and woolly aphid infestations. Red spider (*Tetranychus urticae*) was evident as usual, but the populations dwindled markedly in most localities due to the continued summer rains. Rather heavier infestations occurred on all types of fruit trees in the Orange district, where conditions were drier compared with other districts.

The red mite (*Bryobia praetiosa*) was again in evidence in the Batlow district, and heavy incrustations of overwintering eggs were found in the calyces of Granny Smith apples. In the Murrumbidgee Irrigation Area and at Orange, red mite was present in numbers only on Delicious apples until mid-summer, when a pronounced population drop occurred. Woolly aphid (*Eriosoma lanigerum*) built up in most districts during the growing season, but a marked decline in numbers was brought about late in the season by the activity of the parasite *Aphelinus mali*. Light brown apple moth (*Tortrix postvittana*) was evident in several orchards in the Orange district, causing appreciable damage to William's pears. Odd specimens of Granny Smith apples were also damaged at Bathurst. This occurrence is of particular interest, as reports overseas and elsewhere in Australia, have indicated that this type of moth tends to increase when DDT is used for the control of codling moth.

Green peach and black peach aphids (*Myzus persicae* and *Anuraphis persicae-niger*) caused little damage during the past season, due probably in a large measure to the very effective sprays now available. Cherry aphid (*Myzus cerasi*) commenced to build up in the Orange district, but was practically eliminated in November by a great influx of ladybirds (*Coccinella repanda* and *Leis conformis*) and hover flies (*Xanthogramma grandicorne*).

Some plant bug injury to stone fruits occurred in the Metropolitan districts. A coreid bug (*Amblypelta nitida*) was proved to be responsible for a fruit pitting of plums,

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nectarines and peaches. This type of damage had previously been considered to be associated with unfavourable growing conditions. Feeding also produced internal gum pockets, a condition which had been noted on several previous occasions in plums and peaches. The shield bug (*Lampromieca aerea*) was found clustered on a number of peach trees at Carlingford, and caused some fruit distortion but did not cause definite pitting or gum pockets.

Bronze orange bug (*Rhoecocoris sulciventris*) was again recorded from the Parramatta area and now may be considered to be established in the Gosford district. Citrus bud mite (*Aceria sheldoni*) increased considerably in the Gosford district on Navel oranges, lemons and Wheeny grapefruit, probably due to lack of oil spraying owing to prolonged unsuitable weather.

Vegetable and Flower Pests.

Potato moth (*Gnorimoschema operculella*) caused comparatively little damage, an appreciable degree of infestation being recorded only on the central tablelands. Losses at harvest were rather less than might have been expected judging by the infestation early in the season, but opportune late falls of rain sealed soil cracks and prevented further tuber losses.

Bean fly (*Agromyza phaseoli*) damage was not particularly severe and losses were smaller than usual even in the autumn crops normally subject to injury. Black aphids (*Aphis gossypii*, and other species of *Aphis*), as previously stated, were in plague numbers over most of the State in September and October and caused very considerable losses in beans, cucurbits, peas and carrots. Bean thrips (*Taeniothrips usitatus*) caused some failure to set beans and contortion of pods in the Gosford district, particularly where close successions of crops were grown. A rusted condition of pods, usually considered to be due to unfavourable weather conditions, was found associated with a red spider (*Tenuipalpus californicus*). This mite was prevalent and was recorded from a number of flowering plants, including fuchsia, veronica and hydrangea. Some lemon trees were also infested in the Metropolitan Area and the fruits were extensively silvered or russetted.

Green vegetable bug (*Nezara viridula*) was not as much in evidence as in the previous season, but even so numerous inquiries were received for control, from both coastal and inland districts. The recent position has been such that an attempt has been made to carry out further breeding and distribution of the green vegetable bug egg-parasite, *Microphanurus basalis*. The European earwig (*Forficula auricularia*) continues to cause concern in some of the southern sections of the State, and heavy populations were recorded at Cooma and Berridale. Specimens were also received from Lithgow and Jerilderie.

Silver beet leaf-miner (*Haplomyza imitans*) caused considerable damage to crops in the Wellington district. The pumpkin beetle (*Aulacophora hilaris*) and 28-spotted ladybird (*Epilachna 28-punctata*) were both more in evidence than in previous seasons and damaged cucurbits generally. The ladybird was common in the Metropolitan Area, and fed on tomatoes and potatoes as well as cucurbits. Cabbage moth (*Plutella maculipennis*), and cabbage white butterfly (*Pieris rapae*), were both prevalent but losses were small, due to the very effective control measures available. Neglected crops and cruciferous weeds became heavily infested late in the season in a number of localities. Slaty-grey aphid (*Brevicoryne brassicae*) was prevalent as usual and caused damage during the dry spring months. Wireworms (*Elateridae*) were reported from a number of localities and were stated to be damaging crops such as cucurbits, maize, wheat and sugar cane. Losses generally were not great and seemed to be more serious in land freshly brought into cultivation. Rutherglen bug (*Nysius vinitor*) caused little concern and was reported only from the Murrumbidgee Irrigation Area, Gosford, Cowra and the Metropolitan Area. Mushroom mite (*Tyrophagus putrescentiae*) has not produced the same number of inquiries this season, possibly due to the fairly general use of BHC in composts. The mushroom Tarsonemid mite (? *Pigmaeophorus americanus*) was again recorded from compost in the Metropolitan Area, but no clear-cut evidence of damage has been obtained in spite of the masses of mites found in clusters on the surface of the beds.

The onion thrips (*Thrips tabaci*), was recorded from a number of localities and in particular from the Gosford district, where cucumbers, potatoes and onions were damaged during the spring months. Peas in the Windsor district were also infested and yielded lightly. This light yield might possibly have been due to cold conditions at flowering. Bronze wilt was normally heavy in the Gosford district, but was relatively light in the Metropolitan Area, where an attempt was made to correlate the wilt infection with the thrips carrier.

The Heliothis caterpillars (*Heliothis armigera*) caused little damage to tomato crops undoubtedly due to the efficiency of DDT in controlling this pest. Considerable losses in canning peas and canning beans were reported from the Windsor and Richmond districts. Caterpillars were also reported in numbers feeding on seed capsules of sand spurrey (*Spergularia* sp.), in the spring in the Gosford district, and as causing slight damage to canning peas in the Murrumbidgee Irrigation Area. Tomato mite (*Vasates destructor*) developed to considerable numbers in untreated or poorly-treated crops in the Gosford and Cowra districts.

Fuller's rose weevil (*Pantomorus godmani*) was prevalent in the Gosford and Metropolitan districts, and damaged citrus as well as a wide variety of vegetables and flowers. Control of this weevil is a problem in early bean crops at Gosford when weed growth in which feeding is taking place is turned in and beans planted.

Mice and rats were recorded attacking irrigated crops of tomatoes along the banks of the Lachlan River between Cowra and Forbes, and in many instances losses were more severe than those occasioned by insect pests. Well-coloured and ripe fruits only were attacked. This is the first record of rodent damage of this kind, and it may be possible that control measures may need to be developed if the trouble is not purely seasonal and similar losses occur in the future.

The azalea lace bug (*Stephanitis queenslandicus*) and black thrips (*Heliothrips haemorrhoidalis*) were prevalent and caused more trouble than usual in the Metropolitan Area. Flights of thrips were observed during February and Valencia oranges, as well as azaleas and fuchsia, were blemished.

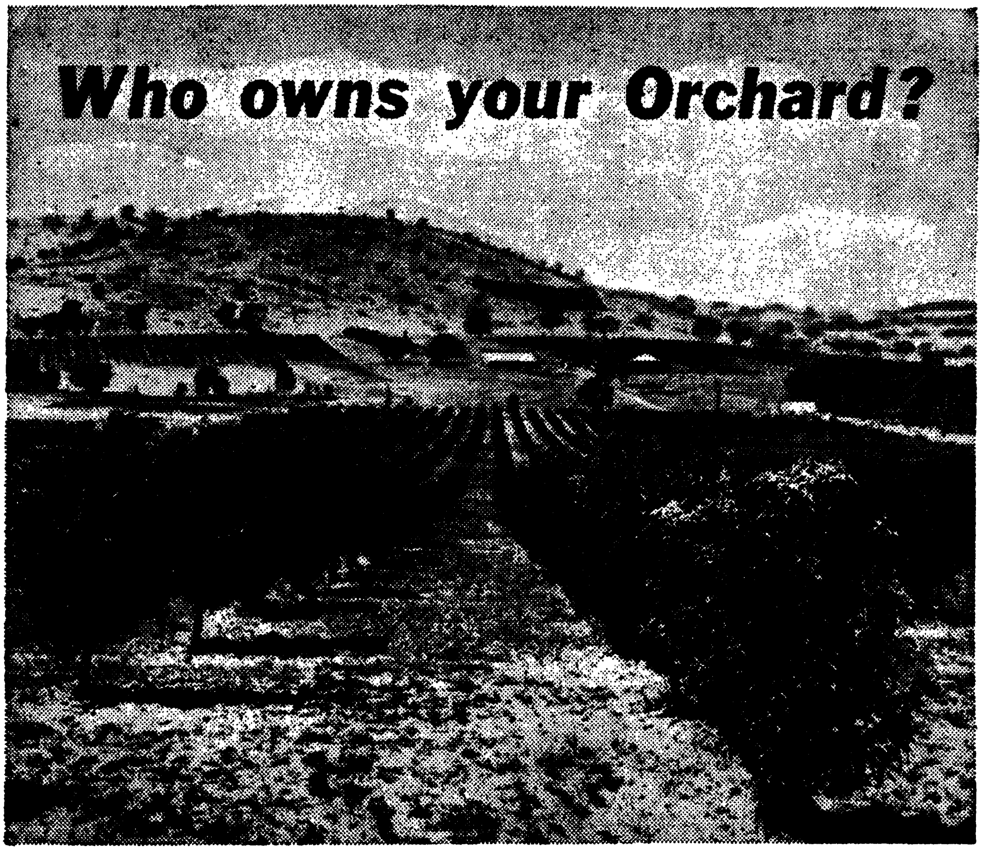
Snails (*Helix aspersa*) and slugs (*Limax* sp.) were very prevalent, as would be expected under conditions of continuous rainfall and lush growth. Damage occurred in citrus orchards, and in vegetable and flower crops in the Central Coast area.

Miscellaneous Pests.

Sheep blowfly (*Lucilia caprina*, etc.), caused relatively little concern during the past season, and experimental work had to be cancelled due to the comparatively dry conditions during the spring. Some fly activity occurred during the autumn, but the overall picture was one of comparative freedom, particularly when compared with the previous season, when fly strike was more prevalent than for many years past and body strike was unprecedentedly common.

A number of domestic or household pests appeared to be unusually troublesome in the Metropolitan Area. Grass itch mite (*Acomatacarus australiensis*) caused annoyance from December onwards, and a number of heavy infestations of "seed" dog ticks (*Ixodes holocyclus*) were recorded, particularly from suburbs on the northern side of the Sydney Harbour. Many suburbs experienced a plague of fleas, and both the human flea (*Pulex irritans*) and cat and dog flea (*Ctenocephalides felis* and *C. canis*) were involved. Several metropolitan rubbish dumps were heavily infested with the German cockroach (*Blattella germanica*), which caused considerable annoyance when nearby houses were invaded.

The possibility of introducing insect pests has been emphasised recently by reports of serious losses caused by the war-time introduction of the Oriental fruit fly (*Dacus dorsalis*) into Hawaii. The most important pest intercepted during the year by the Quarantine Service was probably the European red mite (*Paratetranychus pilosus*), of which overwintering eggs were found on large consignments of nursery stock. This mite apparently does not occur on the mainland of Australia, and its establishment in this State would materially affect spraying programmes.



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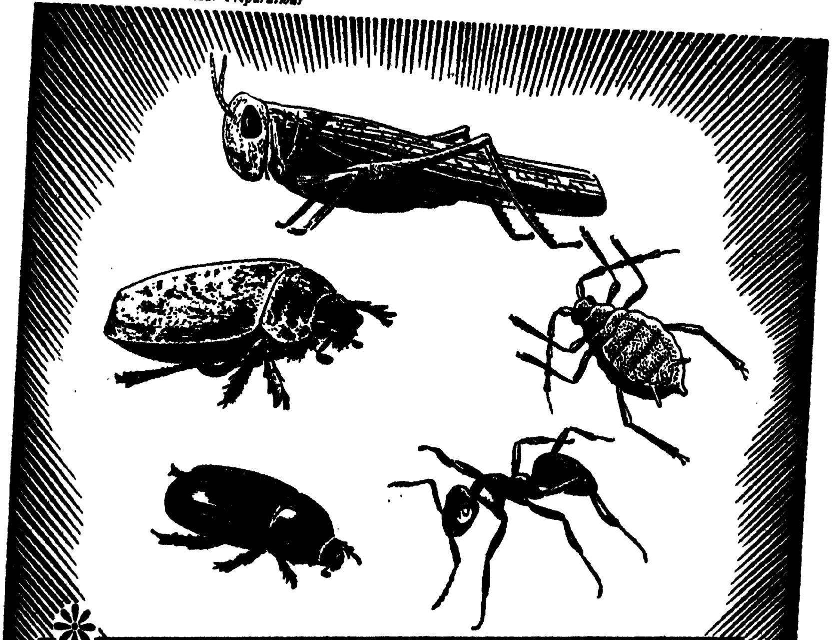

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THE PASTURE SCARAB

(*Aphodius howitti* Hope)

A Pest in the Orange District

N. C. LLOYD, B.Sc.Agr., Entomologist.

THE Pasture Scarab is a pest of improved pastures, lawns, golf fairways and parks, mainly in certain areas of the highland districts of this State.

The larva of this pest, under conditions favourable to it, typically causes a thinning out of improved pastures, with consequent loss of winter feed in the Orange district. Where larvae are numerous they may cause considerable damage, even complete denudation. It is not often that permanent damage to the pasture results, but if unfavourable pasture conditions prevail in the following spring and summer, larval damage may be heavy, and being followed by slow winter growth, recovery from the setback is slow.

This article discusses observations made on the life history and habits of this pest, and control experiments which indicated the use of BHC baits as the most promising method of control.

This scarab has been present in the southern tablelands around Goubum and Crookwell, at least since 1932 when it was recorded causing damage to golf greens. It is now widely distributed throughout a large area of the central tablelands, including Orange, and extending south-west through Millthorpe, Blayney, Carcoar, Neville and Barry. It occurs at Bathurst, but is not a major pest there. The approximate known extent of its distribution on the central tablelands is shown in the accompanying map.

There appears to be no Departmental record of this pest, in the Orange district, before 1943, when it was recorded damaging lawns, but from discussions with graziers in the district there seems to be no doubt that it was present in parts, as early as 1941. Since then it has caused a certain amount of injury each year, the damage being particularly severe during the dry years of 1944 and 1945. In 1948, very little injury was caused, owing to the good rainfall and vigorous pasture growth.

The distribution coincides with regions of fairly high rainfall (average 30 inches), fertile soil, mostly of basaltic origin and of high elevation (generally over 2,500 feet) with a temperate climate. Such conditions are very suitable for the establishment of improved pastures of mixed annual grasses and clovers, particularly Subterranean clover. This scarab is essentially a pest of such pastures, being rarely found in natural grassland. However, a species which appears to be identical was recorded attacking grass near Cooma in 1903, at Bombala in 1906, and at Young and Harden in 1927.

This scarab also occurs in the temperate southern parts of Victoria and South Australia[1, 2, 3], where it has been known as a pest of improved pastures and lawns, at least since 1930. It has increased in numbers there, owing to the wider use of improved pastures and to the greater number of livestock carried on these areas.

Life-history and Habits.

During the past two seasons, observations have been made on the life-history and habits of this pest, and control experiments have been carried out.

The Pasture Scarab is a native species of beetle belonging to the family *Scarabaeidae*, the members of which, in their larval or grub stage, are mostly soil inhabitants, being known popularly as "white curl grubs." These larvae feed on soil organic matter, on decaying wood or on the roots of plants. The larvae of the Pasture Scarab are unusual in that they tunnel to the surface of the soil and feed on the tender young leaves of annual grasses and clovers.

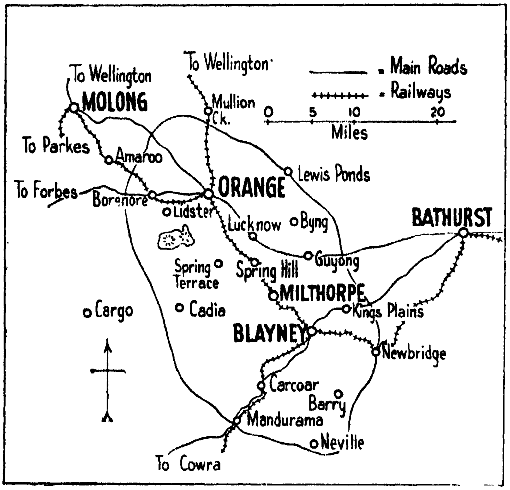
The Adult.

The adult is a small, dark brown beetle, about 3/8 inch in length. The males and females are very similar in form, though

the males are generally slightly larger and have the pronotum, or front portion of the thorax, slightly but distinctly wider than the remainder of the body. In the female it is the same width.

The beetles emerge from the ground on warm sultry nights. They are attracted to lights, particularly neon, in vast numbers, and in Orange pile up in masses on the pavements beneath shop signs.

A few adult beetles emerge from the soil during January (the earliest record for Orange being 14th January), but the great majority emerge during February, and emergence continues for about four weeks. On becoming adult they remain in the soil



Map showing Known Distribution of the Pasture Scarab in the Central Tablelands of New South Wales.

for a few days before emerging, during which time they harden and darken. After mating, the females crawl back into the soil to lay their eggs.

The beetles have not been observed to feed, and are very short-lived, the longest survival noted being only four days from the time of emergence.

The Eggs.

The eggs, which are about the size of a pin-head, are pale creamy-yellow in colour. They are laid during February, either in the soil or in concentrations of organic matter, such as sheep manure, which is particularly attractive to the adult beetles. The eggs hatch in late February and early March.

Observations made have been in agreement with those of Andrewartha,[1] who states that the adult beetles do not lay eggs in areas thickly covered with a long growth of pasture, but prefer areas of scanty vegetative cover. During the late summer of 1948, when the adults were ready to lay eggs, a very thick cover of grass was present, with relatively few areas sparsely covered. It was noticeable that infestations aways occurred in those areas which had a poor cover of grass at the time the beetles were laying eggs.

The Larvae.

The larvae or grubs, which measure about ¾ inch in length when fully-fed, have well-developed legs, and can move about actively over the surface of the ground. They have large, prominent, dark brown heads, and bluish-grey bodies, the body colour being due to the food material showing through the translucent skin.

The young larvae feed on organic matter in the soil for a period varying from about two to four weeks, before coming to the surface to feed. The larvae can, apparently at any time during their feeding period, exist for long periods in the soil without coming to the surface to feed. The time of commencement of surface feeding appears to depend on the soil being sufficiently softened by moisture for tunnelling to take place. In pastures, therefore, surface activity does not occur until rain has fallen in April (it fell on 12th in 1948). Where artificial watering is carried out, as on lawns and in parks, surface activity may commence towards the end of March.

The larvae construct vertical tunnels, up to 8 or 9 inches in length, and about ¼ inch in diameter, and during the day they rest at the bottom of these. At night they crawl to the surface to feed on the young leaves. They have the habit of carrying small pieces of chewed-off grass and clover down into the tunnels.

Surface feeding activity is characterised by the deposition of small heaps of loose soil or "casts" around the entrances to the tunnels. Where larvae are numerous, these "casts" may form a continuous layer of loose soil over the infested area, covering the surface to perhaps 1 inch in depth, thus fouling the short pasture growth and making

it unattractive to stock. The fairways of golf links, and lawns in parks and gardens, may also become denuded of vegetation and covered with loose soil.

The larvae feed on pastures from April until September, but their activities fluctuate, according to weather conditions, being greatest during periods of clear, dry weather when the soil is moist (not wet), and day temperatures relatively high. Activity ceases when the soil is cold and wet, following on rain or snow, and during periods of unsettled weather. The rather severe winter conditions in the Orange district may temporarily stop surface activity, but do not appear to cause any mortality of the larvae. Larval mortality, however, is caused by prolonged water-logging of the soil, but the pest does not often occur in areas where such conditions obtain.

Commencing in August, but mostly during September, the larvae cease feeding. They remain quiescent at the bottom of their burrows, and their colour changes to a uniform creamy-yellow, this being due to the elimination of the contents of the digestive system. This stage, known as the prepupal stage, is similar in form to the larval stage. The prepupae do not feed, and do not crawl to the surface. Although normally inactive, prepupae, when disturbed, are quite as active as in the larval feeding stage.

Practically all the larvae have entered the prepupal stage by the end of September, and damage to pastures ceases for that year. The prepupal stage lasts for an average period of three months, from late September until late December.

The Pupae.

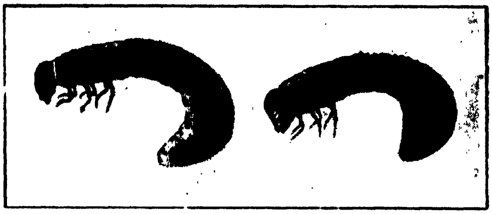
The pupae, which measure ½ inch in length, are found in small earthern cells at the bottom of the tunnels. They are delicate and pale creamy-yellow in colour. The transformation from prepupae to pupae occurs about the end of December and the duration of the pupal stage is about one month.

Seasonal Life-history.

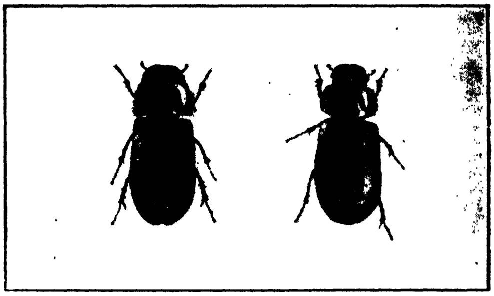
The approximate seasonal life-history in the Orange district is as follows:—The eggs are laid in February and hatch in late February and early March. Larval feeding stages are from mid-March to late-September and surface activity, depending upon the date of the first autumn rains, from early April to late September, and the prepupal stage from late September to late December. The pupal stage lasts from late December to late January, and adults emerge in late January to late February, the peak period being mid-February.

Pasture Damage.

Heavy stocking of pastures, by keeping the growth short, accentuates the damage caused by the larvae, as tender new shoots



The Pasture Grub.
(Twice actual size.)



Adults (Beetles) of the Pasture Grub.
(Twice actual size.)

put out by the plants are attacked. Thus, with continued heavy grazing, the plants are unable to recover.

Where the summer has been dry, the growth of improved pastures is often very sparse at the time the beetles are laying their eggs, and these sparsely covered areas are attractive to them. Dry weather during the autumn prevents rapid growth of pasture plants, so that, as with heavy stocking, recovery from larval feeding is impeded. Areas where there is a heavy accumulation of animal manure, in or on the soil, such as in the vicinity of sheep camps, are usually more heavily infested than neighbouring areas.

A feature of the incidence of the pest is that certain portions of a paddock, varying from a few square yards to perhaps half an acre in extent, are much more heavily infested than the remainder. These infested areas increase in size as the season progresses, the larvae moving away from the original areas of infestation in search of fresh pasture growth.

Where the larvae are numerous, there may be up to 150 burrows to the square foot, and complete denudation of the pasture may result. More typically, there is a thinning out of the pasture, with gaps of a few inches between the plants, instead of a continuous ground cover.

It is not often that permanent damage to the pasture results, and, given favourable conditions during the following spring and summer, the pasture can and does recover. However, if conditions are not reasonably favourable during the spring, when the annual plants are in flower, heavy larval damage may prejudice their regeneration. The very slow growth made by pasture plants during the winter, at Orange, means that recovery from any setback must necessarily be slow.

It has been found in Victoria[3] that grasses such as *Phalaris* and *Danthonia*, and strong-growing perennial rye are resistant to attack, and also that damage to Subterranean clover is more severe where it has been established after cropping, than when established in a pasture consisting of native grasses.

Possible Control Measures.

Various methods of control by means of cultural practices have been suggested.[1, 2, 3] Those advocated included ploughing up of such parts of the infested pasture as are cultivable and sowing with oats, perennial rye and *Phalaris;* the greater use of *Phalaris* in pastures; and the avoidance of heavy top-dressing and heavy grazing of infested areas —and on land which is not cultivable, reduced stocking in summer to try to retain a cover of old pasture growth until the young autumn growth appears.

Tests carried out at Goulburn in 1932, by Wason[4] for the control of larvae attacking golf greens, demonstrated that large numbers were killed by spraying or dusting with lead arsenate. Two applications, with an interval of fourteen days between each, were made early in the season. Better control, however, was obtained by incorporating lead arsenate with top soil, using 5 lb. of powder to 1,000 square feet. This latter method has been used successfully in golf and bowling greens and similar valuable but limited areas of turf.

The greenkeeper at the Orange Golf Club reported using a proprietary dust containing 3 per cent. BHC (benzene hexachloride) with good results, in May, 1947. An area of 1,000 square feet of infested fairway was dusted and a large number of larvae were found dead on the surface a few days after treatment. No further damage occurred in that portion of the fairway for the remainder of the season.

Control Experiments at Orange.

The first experiments were carried out late in the feeding period, August-September, 1947, at the Orange Golf Club, and on a property at Borenore, about 8 miles west of Orange.

The insecticides tested included: BHC-bran bait; BHC dust, 2 per cent.; BHC spray, 0.1 per cent.; DDT spray, 0.1 per cent.; and DDT dust, 2 per cent.

Small plots 6 feet by 6 feet were used, and the dusts and sprays were applied with knapsack equipment. The plots were not replicated.

However, little surface activity occurred after the applications were made and none of the treatments caused any mortality of the larvae up to the time that feeding ceased, but a considerable diminution of surface activity was noticed, when compared with the untreated plots.

The 1948 Trials.

The 1948 season was one of very light infestation generally; however, there was sufficient infestation on one of the fairways at the golf links, for a number of plots, each 6 feet by 6 feet, to be used, and tests were carried out from late May to mid-July.

The chemicals tested were: DDT dust, 2 per cent.; DDT (dispersible powder) spray, 0.1 per cent.; chlordane emulsion; BHC dusts, containing 3, 2 and 1 per cent.; BHC (dispersible powder) spray, and bran and compost baits containing BHC.

36 m.p.g.
Average of four tests — three at 35-40 m.p.h. — one at 50-55 m.p.h.
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33.6 m.p g.
Average speed 33.2 m.p.h.
R.A.C.V. "The Radiator"

36.8 m.p.g.
average of six tests R.A.A.
"The S.A. Motor" Feb.

32.2 m.p.g.
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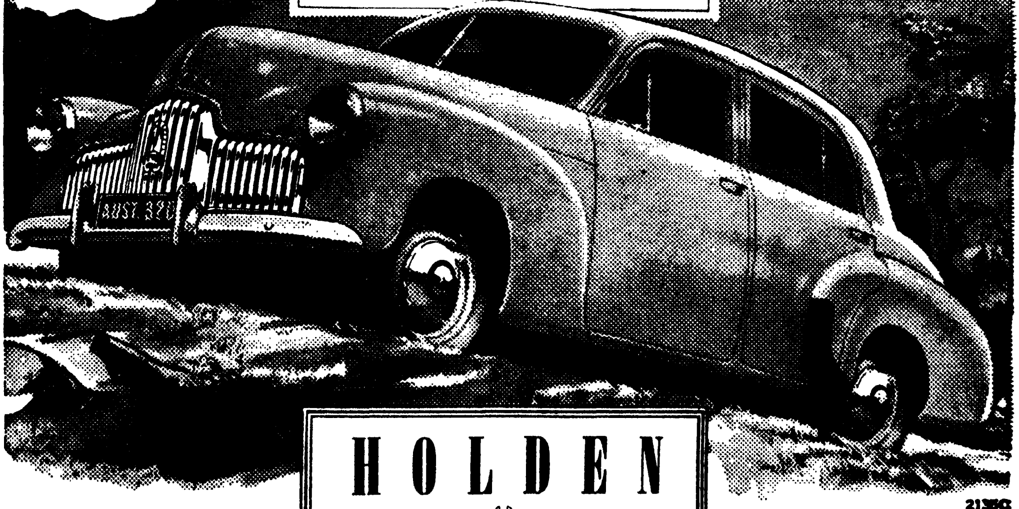

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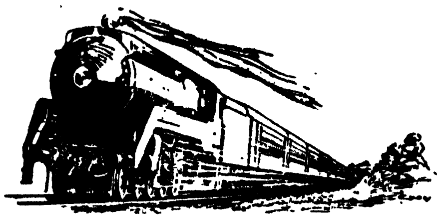

TRAIN SERVICE REDUCTIONS

When the general coal strike began on Monday, 27th June, drastic reductions in train services were unavoidable.

Every endeavour was made by the Department of Railways to make the best of the unfortunate set of circumstances. Passenger and goods train services were re-arranged to effect the necessary reductions in coal consumption with as little inconvenience as possible. Nevertheless, it is known that many train travellers and consignors have been adversely affected by the measures that had to be taken.

The Department regrets any inconvenience or hardship caused by the reduced services. Also, it greatly appreciates the co-operation on the part of those who refrained from unnecessary travel and otherwise avoided overtaxing the limited railway services available.

S. R. NICHOLAS,
Secretary for Railways.

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The insecticides were applied at various times during the winter surface-feeding period (late May to mid-July). The areas selected were heavily infested with the larvae as indicated by soil "casts." Adjacent areas were left untreated as checks.

Results were assessed on the basis of (A) continued larval activity on the surface of the plots, and (B) counts of living and dead larvae made at intervals in sample areas of 2 square feet, excavated to a depth of 8 to 9 inches.

These tests indicated that BHC was more effective than DDT. The BHC dusts at 3 per cent., and 2 per cent., and BHC spray at 0.2 per cent. reduced surface activity of the larvae almost completely and gave a good kill of larvae in the soil. The toxic effect was slow, except with the 3 per cent. BHC dust, where a few larvae were dead four to five days after treatment.

DDT was effective in preventing surface activity for three to four weeks, but did not give as satisfactory a kill of larvae as BHC.

Chlordane emulsion at the rate of 2½ fluid oz. per 1,000 square feet, watered on with a can, did not give any worthwhile results.

A Further Experiment With BHC.

As a result of these investigations, a further experiment, using BHC, was carried out on the golf links, commencing in July, during a period of considerable surface activity of the larvae.

The materials used were as follow:—

BHC spray: Containing 0.1 per cent. total isomers (prepared from a dispersible powder containing 50 per cent. total isomers).

BHC compost-bait: 1 oz. BHC dust (containing 13 per cent. total isomers), mixed with 2 lb. of compost (to give a concentration of approximately 0.4 per cent. total isomers). The compost consisted of a mixture of well-rotted sheep manure, leaf mould and soil.

BHC bran-bait: 1 oz. BHC dust (containing 13 per cent. total isomers), mixed with 2 lb. bran and moistened with water to form a crumbly mash.

BHC dust (containing 2 per cent. total isomers).

Check: Two plots were left untreated.

Treatment was commenced late in the afternoon of 19th July, during a period of great larval surface activity. The plots, each 6 feet by 6 feet, were separated from each other by a minimum of 2 feet; further spacing was not possible owing to limitation of the area infested.

Prior to treatment, a guide to larval activity was obtained by counting the number of soil "casts" in each plot during the previous twenty-four hours. After treatment, the plots were examined at frequent intervals, and larval activity again measured by counting the "casts." Examination was also made for any dead larvae on the surface.

Several examinations of approximately 2 square feet of soil in each plot were made and the numbers of live and dead larvae recorded. Dead larvae were removed, but live ones were placed back in the soil.

Final counts of larvae were made at the end of September and early October, in an area 3 feet by 3 feet in the centre of each plot. These areas included the sampling 2 square feet areas already examined.

Reduction of Surface Activity.

For the first two days after treatment with BHC, the larvae came to the surface in large numbers. The bait treatments induced more activity than the dust or spray, and this may explain the greater mortality of larvae which was obtained by use of the baits, as a greater number of larvae may have come into contact with the insecticide. No appreciable amount of feeding took place on the treated plots after the first two days.

Treatment with BHC almost completely eliminated surface activity from the fourth day onwards until the end of the feeding season, a period of approximately two months, from the date of application, but during all this time, live larvae could be found within the plots, the larvae, apparently, being capable of living for long periods in the soil without coming to the surface to feed.

Toxic Effect of BHC.

The toxic effect of BHC on the larvae was extremely slow, the first dead being found eighteen to twenty-one days after

treatment. The mortality reached 50 per cent., about a month after treatment, where the baits had been used.

In two plots baited on 8th August about 50 per cent. larval mortality had occurred twenty-one days later. No dead larvae were found on the surface.

The bait treatments effected a kill of approximately 60 per cent. of late-stage larvae in the plots, over a period of some weeks and prevented the remainder from feeding on the surface. The spray produced approximately 46 per cent. mortality, and the dust approximately 37 per cent. The bran bait was not as attractive to the larvae nor as effective as the compost bait, but was easier to mix and more economical to use. Only ½ lb. of bran bait was used per plot, whereas 1½ lb. of compost bait was required to obtain an approximately equivalent covering of the ground. This means that considerably more BHC was applied per unit area.

Counts of live and dead larvae and the percentage mortality for the various treatments are shown in the following table:—

Treatment.	Live Larvæ.	Dead Larvæ.	Percentage Mortality.
			Per cent.
BHC spray	30	26	46
BHC dust	64	37	37
BHC compost (19-9-48).	64	104	62
BHC compost (10-8-48).	66	109	62
BHC bran ... ... (19-7-48).	67	93	58
BHC bran ... ... (10-8-48).	55	87	61
Check untreated ...	108	3	2·5

DISCUSSION.

Pasture Infestation.—It is the opinion of the writer that the most promising means of control in pastures lies in the use of BHC bran, or BHC compost-baits, during April or May. If pastoralists survey improved pasture paddocks after the first autumn rains in April and note the areas in which infestation is occurring, the bait could then be applied to all these, which at that time of the year, should be relatively small.

It remains for future work to show whether control can be obtained on a field scale, also the quantity of bait required per acre, and the cost of baiting. In addition it must be determined whether one application of bait would suffice for the season or whether a second application would be necessary.

Consideration must also be given to any possible effect baiting may have on livestock, although no danger should occur, as the BHC-bran bait used is similar to that recommended for the control of grasshoppers.[5] BHC is relatively non-poisonous to man and the higher animals, and the bait is applied so lightly that it would be difficult for stock to ingest sufficient of it to cause harm. Also stock could be excluded from a paddock, or portion of a paddock, for a week or so after treatment.

Golf and Bowling Greens.—These may be protected effectively by the lead arsenate "grub-proofing" method mentioned earlier.

Lawns.—Lawns may also be "grub-proofed," or infested areas may be sprayed or dusted with BHC as soon as damage is noticed, in March or April. This will prevent surface activity of the larvae for a period of some weeks, after which, if further signs of activity appear, another application may be made. The baiting method could be used, particularly on larger areas, where dusting or spraying with knapsack equipment would be a long and tedious process.

SUMMARY.

The Pasture Scarab is a pest of improved pastures, lawns, parks and fairways in certain areas of the central tablelands of New South Wales, having been present there, at least, since 1941.

The beetles prefer areas thinly covered with vegetation, for egg-laying, and in years of low summer and autumn rainfall, in which poor growth of pastures occurs, they may cause considerable damage.

There is one generation a year.

Damage by the larvae occurs from April to September, and results in a loss of winter feed which is, at best, never over-plentiful.

Control of the larvae on small areas is obtainable either by "grub-proofing" with lead arsenate, or by the application of BHC baits, sprays or dusts.

BHC-bran or BHC-compost baits are considered most promising for control in large areas of pasture, but further work is necessary to demonstrate whether such control is practicable, and the cost reasonable.

(*Continued on page* 446.)

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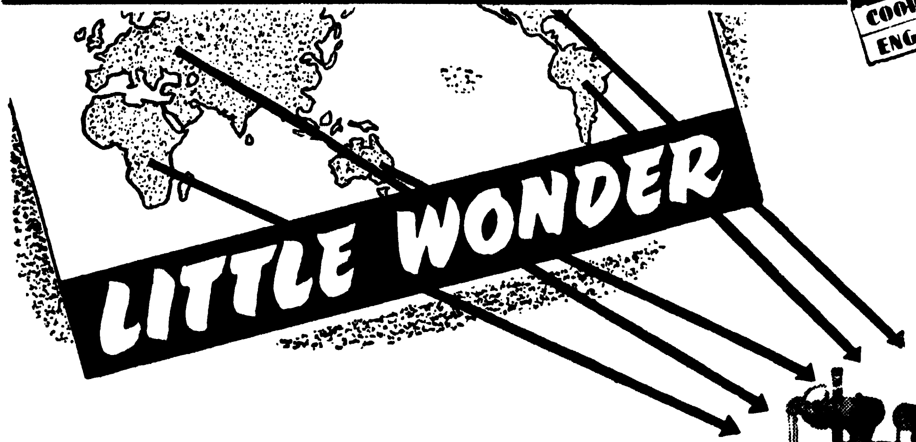

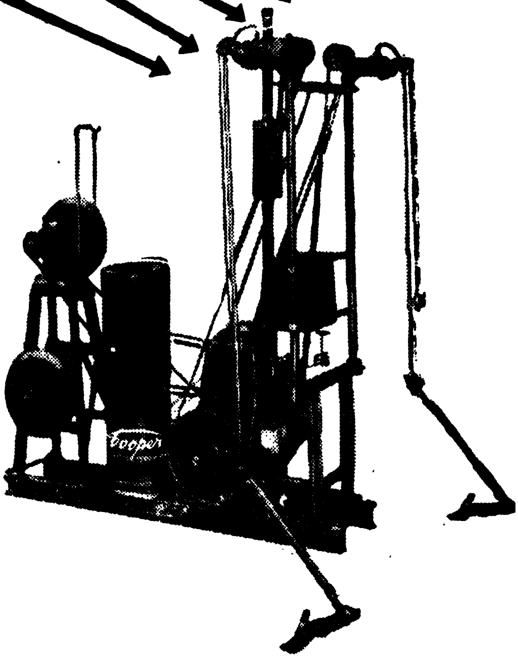

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APIARY NOTES

Beekeeping Records

D. L. MORISON, B.V.Sc., Apiary Branch.

ALTHOUGH the keeping of accurate records is now an integral part of many important activities, beekeeping records present some special problems, meriting a systematic approach.

Many beekeepers fail to keep adequate records, maintaining that straight-out production is all that is required. This, however, is a mistaken attitude, for the advantages of record keeping are many.

Adequate records not only aid low-cost production by rendering certain important facts and trends more apparent, but enable the apiarist to plan ahead for his apiary management, his requirements of essential materials and the marketing of his honey. Moreover, efficient apairists' records are a great help to departmental officers, research workers, etc.—for instance, when starch-testing trees to attempt the more certain prediction of honey flows.

Of course some systems of records are only aids to decisions and, at times, certain variable factors must be taken into consideration. However, an intelligent interpretation of an adequate system of records will enable the formulation of correct conclusions in a large percentage of cases.

In preparing to keep systematic records covering any particular activity, a basic set-up must first be decided upon. This should be adequate in scope for collection of all necessary data and allow of easy interpretation when such is necessary.

Advantages of Standard Materials and Procedures.

It will be found much easier to keep systematic records if uniform and standard apiary procedures and materials are utilised.

since much standard information may already be available on these, and large numbers of similar items may be included under simple headings.

Some persons may claim that individual peculiarities assist in the identification of certain hives, etc. However, such lack of uniformity could only have an advantage on a small scale, and proper numerical and/or alphabetical identification is essential if individual items are to be identified with certainty when large numbers are being dealt with.

The actual collection of records must be done accurately and regularly, otherwise an incomplete or perhaps misleading set of records will result. As soon as it becomes apparent that many facts or figures are of interest in connection with any particular activity, an immediate start should be made to keep them systematically.

It must be realised that records are not productive in themselves, yet in many instances production cannot proceed efficiently without them. Of course, record keeping should not be carried to extremes so that time is wasted on unnecessary detail and much of the work becomes futile and irksome.

Types of Records.

The beekeeper must, of course, keep accounts, and these form a major item in records. It is not proposed to discuss these here, since suitable procedures are described elsewhere. However, it must be realised that it is essential to keep adequate records of both production and costs. By this means, fluctuations in the beekeepers' margin of profit can be quickly detected, any trend towards loss immediately recognised, and early consideration given to remedial measures. Migratory apiarists especially should carefully cost their operations in the light of any future economic trends.

Files of beekeeping journals, departmental publications, etc., should be systematically kept in order of their date of issue. Some beekeepers have these bound in yearly volumes. A few may wish to group the subject matter of beekeeping literature, especially marketing information and Association affairs, under various headings in a card-index system for easy reference.

The systematic storage of apiarists' materials, equipment, etc., will largely obviate the necessity for keeping any special records in this regard.

Records of Working the Apiary.

These can be conveniently compiled under two headings:—

(1) *Colony Records.*—Owing to the fact that the average beekeeper is a very keen and constant observer, it is hardly necessary to keep individual records of colony strength and condition generally. However, it might be well worthwhile keeping records of the condition of large groups of hives (apiary units), especially when winter flows or pollen-deficient species are being worked.

Individual colony records are, however, essential in the queen-breeding apiary, where a record must be kept of individual queens used for breeding purposes. It may be necessary to brand individual queens on the back of the thorax, either with a material such as nail polish or small discs affixed with a spirit gum.

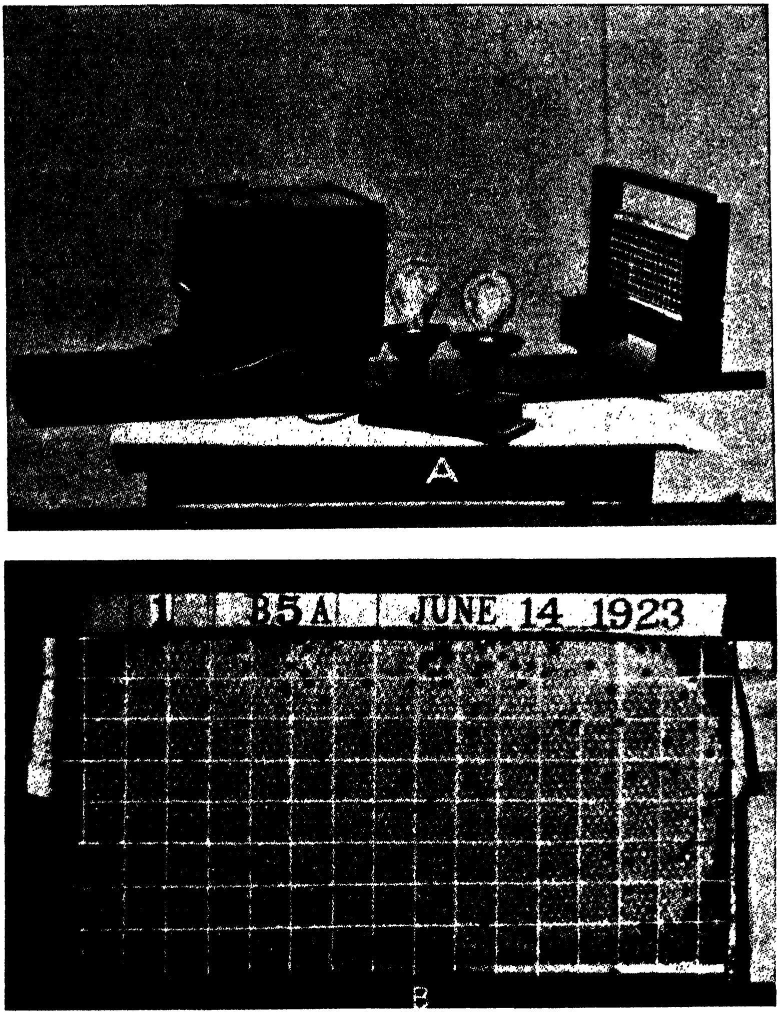
A very convenient method of keeping colony records is to insert a suitably ruled card between inner cover and the cover of the hive: details as to the parentage of the queen, the date of her emergence and other relevant details can be kept.

In the stationary apiary where a systematic layout is practised, colony recording may be worthwhile. It would be an easy matter to number the hives and keep a chart giving a key to recorded particulars, or merely to keep a list of details grouped under respective colony number. When marking numbers on hives for identification purposes the number should be placed on the front of the bottom box, since interchange of supers may result in confusion if the number is placed on supers. Care should also be taken to see that the apiary registration number is distinct from other numbers marked on hives to avoid mistakes by apiary inspectors.

Some beekeepers have rough systems of denoting queenlessness, etc., in colonies, by the position of a stone placed on the hive cover. However, accidents are likely with such systems, which may serve fairly well nevertheless, provided that a high degree of accuracy is not essential.

Material in which American foul brood disease has occurred or colonies in which it is suspected should be suitably marked and recorded, or they could be transferred to a separate apiary where an adequate check can be kept for any further cases of the disease.

A note should be made of the species present, their approximate number and location. Details of this nature would be best marked on a district map, for easy reference later. If such survey indicates poor scope for commercial beekeeping it will be better to move to another district.



Photographic Records of Brood Condition.

Upper.—Apparatus used, showing camera, brood frame holder, with frame of brood in position wire net and electric lamps.

Lower.—Photographic print, which is filed as a permanent record.

[*After U.S.D.A. Bul.* 1349.

2. *Flora Records.*—It would be an advantage to make a survey of the district flora—say within a radius of 20 to 30 miles of the home apiary—so that the movements of any out-apiaries can be made to best advantage.

The compilation of records of the flora may present some difficulty unless one is familiar with eucalypt identification, and it may be best for the novice to make a collection of flora and have unfamiliar species properly identified. In addition to the

initial survey, it will be necessary to make further surveys prior to the blooming periods of the main species to note bud prospects. These should be recorded in the form of a calendar.

Records of the blooming of species and their value for honey and pollen, should also be compiled.

It may not be economical to make special trips for these surveys, but much of the work could be carried out when engaged on other tasks.

The position of apiaries known to the bee-keeper in the area surveyed could also be marked on the map. This is particularly important if the apiaries are on protected sites.

While rainfall may vary very much—even in different parts of the one district—a rainfall record would be of considerable long-term value, since rainfall has such a profund present and future effect on the behaviour of the flora.

Green Sprouting of Potato Seed Has Many Advantages.

THE green sprouting of seed potatoes prior to planting should be of particular interest to coastal growers, as this practice promotes early emergence and more rapid early growth of both foliage and tubers. Green sprouting also enables the young sprouts better to withstand attack by soil-inhabiting diseases such as rhizoctonia. Handling the seed in this way provides an opportunity to discard seed with weak shoots.

Perhaps the most important advantage of greening is that the yield per acre of marketable tubers is usually increased, due to the setting of the tubers under more favourable conditions, as a result of earlier development of the plant.

Green sprouting is easy and inexpensive. It merely involves exposing the uncut seed tubers in thin layers to subdued light for the purpose of developing short, tough, sturdy green sprouts. The floor of a well-lighted barn or hay shed is quite suitable for greening potato seed, provided the seed is protected from damage by mice and rats. In an emergency seed may be green sprouted under a densely foliaged tree. With good conditions seed may be effectively green sprouted in about four weeks.

Careless Winter Methods Bring Dairying Troubles in Spring.

TEMPERATURE plays an important part in the occurrence of bacterial defects in milk and cream. It is possible during the cooler weather of winter to get away temporarily with methods of cleansing that would not be practicable in the warmer months, but such methods are shortsighted.

Unfortunately, it is not always a simple matter to overcome the results of winter-time carelessness. The unsatisfactory methods employed frequently result in distribution of undesirable bacteria right through the plant, and the trouble may persist for several months. Bacteria frequently become established in the utensils, and can only be destroyed by means considerably more expensive and laborious than an effective normal routine.

The moral is, of course, that scrupulous attention to methods of general cleanliness and sterilisation is necessary at all seasons of the year. A pamphlet on protection of milk and cream from harmful bacteria is obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36, G.P.O., Sydney.

Stomach Fluke of Cattle at Casino.

THE stock inspector at Casino recently investigated mortalities in young cattle following scouring and loss of condition, caused by infestation with the stomach fluke.

On several properties more than 50 per cent. of the nine- to twelve-month-old heifers were affected by this fluke, and on some properties up to 20 per cent. of the affected animals died.

In each case improvement followed the use of a phenothiazine drench, suggesting that the condition had been complicated by other internal parasites.

Following the good summer and autumn rains, the ground in the affected area was fairly wet for months, and the many waterholes provided excellent breeding grounds for the snail which is the intermediate host of this parasite.

The condition was also observed in the Glen Innes district, but there were no heavy losses.

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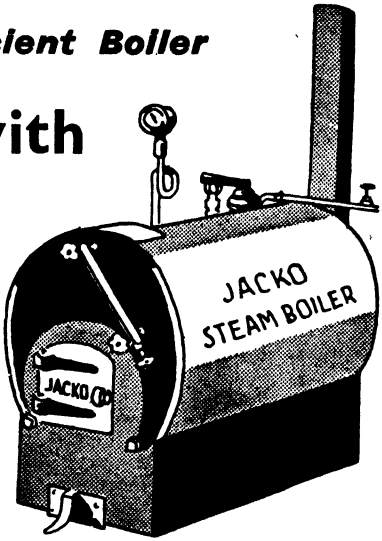

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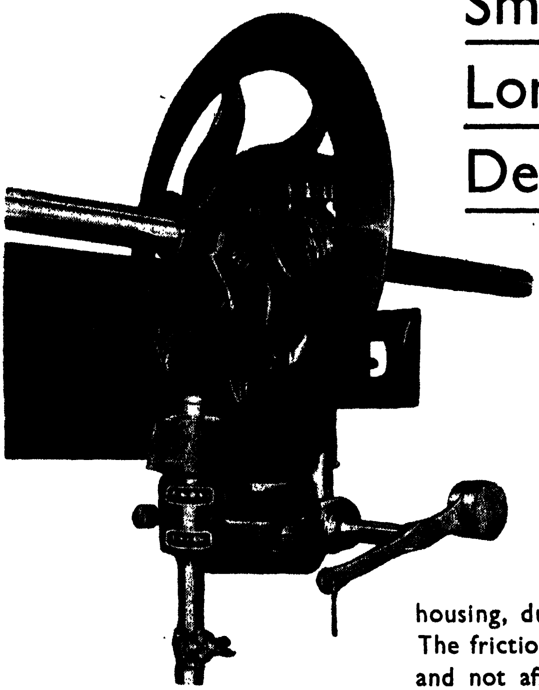

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HELIOTROPE POISONING IN SHEEP

J. C. KEAST, B.V.Sc., Pastures Protection Veterinary Research Officer, Veterinary Research Station, Glenfield.*

MANY sheep losses which, in the past, have been attributed to toxaemic jaundice, have been due to poisoning by the plant *Heliotropium europaeum.* Although extensive heliotrope grazing has been shown to favour a higher incidence of the haemolytic type of jaundice or copper poisoning, the large majority of the losses that have occurred in the Murray Valley have been due to a liver damage resulting from an alkaloid, lasiocarpine, which is present in the plant.

Heliotrope is a summer-growing annual weed which appears to have spread considerably in many areas of New South Wales during the last ten to fifteen years. With summer rains the plant grows profusely in fallows, natural pastures and to a considerably less extent in stubbles, but if summer rains do not occur it may be relatively inconspicuous in grazing areas. The plant does not appear to be attractive to sheep when other green feed is available, but when it occurs as the only green plant in an otherwise mature grassy pasture, it is readily eaten. It is also eaten extensively in the dry state.

Heliotrope poisoning is common on properties in the Murray Valley, particularly in seasons when summer rains have resulted in a heavy growth of the plant. In this area the summer rains in 1946-47 and 1947-48 led to extensive grazing on the plant, with resultant heavy losses in 1947 and 1948. In the latter year many properties lost up to 30 per cent. of the entire breeding stock, while in some individual flocks the losses were over 50 per cent.

Although some losses occur following a single exposure to the plant, the liver damage is progressive and considerably heavier losses can be expected if seasonal conditions favour a second exposure to the heliotrope.

It is not known to what extent heliotrope poisoning occurs in parts of the State other than the Murray Valley, but it is extremely likely that "jaundice" losses in the Berrigan, Wagga and Gundagai districts are due to the ingestion of this plant.

* Substance of a talk given to Stock Inspectors at a Field Day at Glenfield Veterinary Research Station.

Type of Animals Susceptible.

British breeds and their crosses appear most susceptible; it is not known whether the comparative non-susceptibility of Merinos is due to a definite resistance or whether, as more selective grazing animals they ingest less of the plant. There is an age susceptibility, but this is dependant to a large extent on the availability of the plant during the life of the sheep. Thus with good heliotrope summers in 1947 and 1948, it was found that losses in maiden ewes in 1948 were just as severe as in older animals, because they had had two successive exposures to the plant. Rams and wethers appear to be just as susceptible as female animals, provided they have similar opportunities to graze the plant.

Symptoms.

The nature of the disease varies considerably in different seasons and in different flocks. Although most of the grazing on heliotrope occurs from December to April, it is usual to find the highest death rate between June and August, and sometimes extending to November. This explains why purchased sheep often commence to die some months after their removal from an affected area. Odd sheep can, of course, die while grazing on the plant, but the peak of the losses generally occurs in the winter and spring months.

Some animals may simply be found dead without showing previous signs of ill-health, while others may be sick for a few days before dying. A varying proportion become sick and linger for some weeks or even months. In these cases the sheep show

a very rapid and severe loss in bodily condition and may exist for some time in an emaciated state.

Sick sheep may be jaundiced or may show no clinical evidence of icterus. The proportion of cases showing clinical jaundice may vary between 20 and 80 per cent. Of the jaundiced cases, many are of the non-haemolytic type where the urine remains free of blood pigments. The varying and often low proportion of cases showing clinical jaundice often makes field diagnosis difficult, particularly when only one animal is available for autopsy.

Post Mortem Findings.

The appearance of the typical haemolytic jaundice case is well known. When icterus has not been observed clinically, it is possible that some cases will show a lemon tint or slight muddy tint of the carcase indicating the presence of some circulating bile pigments, while in others jaundice is absent. The liver varies betwen a khaki and orange colour, is often enlarged and sometimes fatty.

In the wasting type of case, the liver is often shrunken, fibrosed and hobnailed. The kidneys may be congested. Lesions of enteritis are not infrequently present in both the small and large intestines, and, at times, may be sufficiently severe to result in the presence of free blood in the lumen of the gut.

Prevention.

The ultimate aim must be to eradicate this noxious plant from the property. This will not be an easy matter and will probably be a long range project. Experimental work will be commenced in the near future on various methods of controlling the plant. In the meantime stock losses must be prevented by denying susceptible sheep access to the plant in seasons when it flourishes.

Until the recent demonstration of the toxic properties of heliotrope, little attempt had been made to prevent stock grazing the plant. It is well known that sheep will fatten on it without showing any immediate ill-effects, while it has also been found to keep sheep alive in periods of drought when little other summer feed was available. Many stockowners have grazed the plant heavily on fallow land in an attempt to keep the fallows clean.

All these practices are dangerous, and despite the apparent immediate benefits, it must be realised that the alkaloid present will cause damage to the liver cells and ultimately the health of the sheep will suffer. The prevention of heliotrope grazing is a management problem which must be tackled by each landholder to suit his own property.

Feeding Orphan Pigs.

WHEN sucking pigs are deprived of their dam's milk, they may be successfully reared by artificial feeding on cow's milk.

For the first two or three days after birth, the milk should be broken down with an equal quantity of water. The water should then be gradually reduced and the milk increased. The addition of one teaspoonful of lactose (sugar of milk) to each pint of liquid has produced excellent results.

The pigs should be fed six times each day for the first week. The number of meals per day can then be reduced gradually until at three weeks of age they should be fed three times a day.

The milk is best fed in a shallow dish of glazed earthenware or enamel which can be thoroughly washed after *each* meal. The pigs can be taught to drink by dipping their noses in the milk a few times during the first meal or two. In stubborn cases, it may be necessary to use a bottle with a rubber teat.

When the pigs are three weeks old, they should be given a trough containing dry crushed wheat. As they grow older, meatmeal should be added a little at a time until the proportion reaches 10 per cent. of the wheat.

The pigs should also be provided with a warm shed, ample bedding, and a clean grass run, with access to clean drinking water.

The following important points must be observed:—

1. A high standard of cleanliness must be maintained.

2. The milk must be fresh and should be warmed to blood heat before feeding. The water should be boiled in the early stages.

3. Do not overfeed; otherwise the pigs will scour. If they do so, cut the quantity of milk back. The rule should be "feed a little and feed often."

4. The drinking bottle or dish should be cleaned with boiling water after each meal, in the early stages.

5. Whole milk can be replaced with separated milk gradually after the pigs are three weeks of age.—G. M. D. CARSE, Principal Livestock Officer (Pigs).

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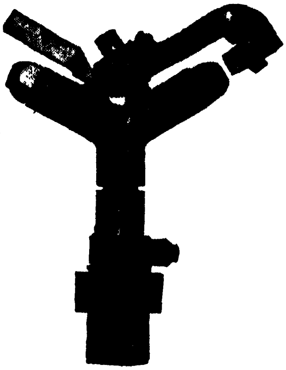

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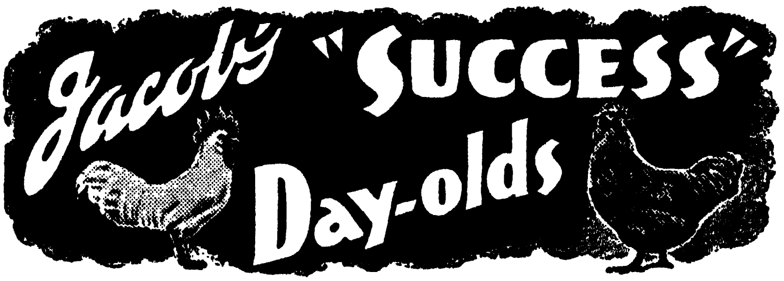

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POULTRY NOTES

PROGENY TESTING

E. HADLINGTON, Principal Livestock Officer (Poultry).

THE recent visit of Dr. Hagedoorn has created widespread interest in progeny testing as applied to poultry breeding, and many inquiries have been received regarding the procedure to adopt on commercial farms.

In order to supply this information the following simple statement of the main points in carrying out this work is supplied.

In the first place it is necessary to have a number of single breeding pens to accommodate one male and his complement of hens—say eight to ten hens in the case of heavy breeds and ten to twelve in the light breeds. It is considered that a minimum of six pens of each breed to be tested is necessary, but preferably ten to twelve of each.

In selecting the hens for breeding, all pens should be as even as possible as regards blood lines; if no new blood has been introduced for several years, so much the better. The males can either be related or be of different blood lines.

It is important to hatch chickens from all groups at the same time so that numbers of pullets of the same ages can be tested for production. The number from each pen should not be less than fifteen but preferably twenty. This necessitates marking all chickens hatched so that the different ages and groups can be identified. This can best be done by using numbered wing bands and recording the numbers of each pen and the different dates hatched.

Many factors may be taken into consideration in deciding which groups are the most satisfactory to use for breeding, but only a few of the main essentials need be considered by the average breeder.

These are:—

(1) Fertility, and if desired, hatchability.

(2) Size of eggs and shell quality of progeny.

(3) Egg production of pullets over at least six months, but preferably up to twelve months.

(4) Incidence of disease and mortality among progeny.

(5) Relative food consumption between different groups (if possible).

Penning the Pullets.

There are two methods of penning the pullets for testing:—

(*a*) The progeny of each group, upon reaching productive age, may be placed in separate pens and the total production of the pullets from each group recorded; or

Members of the Poultry Research Committee with Dr. Hagedoorn at the Poultry Experiment Farm, Seven Hills.

Dr. Hagedoorn is standing in the centre of the group.

(*b*) The pullets from a number of groups can be housed together and trap-nested to check production of the birds from each group. This is the most satisfactory from the point of view of recording, but entails a great deal of work in attending to the trap-nests. Another disadvantage is that, if it is desired to check the food consumption of the various groups, it is necessary to pen separately a sample of each consisting of at least ten to twelve birds for not less than three months to compare the amounts consumed by each group. It would, of course, be more satisfactory to test them over a larger period but the work involved is considerable, as the food has to be weighed accurately and wastage must be avoided, otherwise a proper check on consumption is not possible.

Testing the pullets for egg production in separate pens necessitates the provision of a pen for the pullets of each group to be tested, but as some groups may have been eliminated for various reasons, such as poor fertility, or insufficient numbers of progeny raised to productive age, incidence of disease, etc., the number of pens required may not be as great as the pens used for the breeding groups.

It is important that all the pullets be housed under the same conditions, otherwise environmental factors may render comparison unequal.

Comparing Results.

In deciding which are the best groups from the point of view of egg production, a standard should be adopted somewhat higher than normal pullet production. This means that any groups which do not lay at the rate of a little over 14 dozen eggs per bird per year would not be worth persevering with to improve egg production.

Semi-Intensive Poultry Houses at Poultry Experiment Farm, Seven Hills.

These are used for trap-nesting the pullets in the progeny testing work.

Retaining Males.

A problem associated with progeny testing is that the male progeny has to be retained until the pullets have been tested, and this creates accommodation difficulties, which can, however, be minimised by having the

chickens sexed and eliminating about 80 per cent. at hatching time. This procedure has been adopted at the Poultry Experiment Farm, Seven Hills.

Mating the Progeny.

After having decided which groups of birds are to be retained for breeding purposes, in accordance with the five items considered desirable, the subsequent matings must be planned.

The first choice is to mate the best sires to their daughters, but if, for any reason, a sire is lost the next best mating is a son to his sisters or half sisters. If there are sufficient pullets left in any of the best groups to make another pen or two, these can be mated to their half brothers. The procedure can be followed each year.

Those who have the facilities and are prepared to pay the additional cost might carry out a more extensive scheme of progeny testing by taking into account other factors such as early maturity, broodiness, and "winter pause," and also to trap-nest the breeding pens so that the results of each hen could be recorded.

Progeny Testing at Poultry Experiment Farm, Seven Hills.

In the work being carried out at the Poultry Experiment Farm, Seven Hills, most of the factors mentioned are being considered and the results should be of interest to breeders generally. It should be understood, however, that it may take at least five years to effect any marked improvement in production or to develop a strain showing most of the desirable features referred to.

Pullorum-tested Flocks

THE following is a list of flocks which have complied with the Department's Accredited Pullorum-tested Flock Scheme, and which are tested regularly for pullorum disease:—

Name and Address of Owner.	Breeds.
Kennedy, F. J., "Kenwood," Orchard-avenue, Model Farms.	Australorps, White Leghorns.
Phippard, H. L., Bobbin Head road, Turramurra	Rhode Island Reds, White Leghorns.
Seven Hills Poultry Experiment Farm, Seven Hills.	Australorps, White Leghorns, Chinese Langshans.
Wagga Agricultural College and Experiment Station, Bomen.	Australorps, White Leghorns.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Export of Poultry to South Australia

BY Regulations under the Stock and Poultry Diseases Act, 1934-46, the South Australian Government places restriction on the introduction of fowls, turkeys and guinea fowls into South Australia.

The restriction concerned, is that the birds must be accompanied by a certificate from a Government Veterinary Officer or Inspector of Stock certifying that the birds are free from the disease, infectious laryngo-tracheitis, and furthermore that the disease has not occurred on any of the premises on which the birds have been kept during the previous period of twelve months.

The effect of these restrictions is virtually to prohibit the introduction of the species mentioned into South Australia from the Counties of Cumberland and Northumberland, and from most of the other recognised poultry districts of the State —with the exception of the Tamworth area, which is a protected area against this disease.

It is desired to remind poultry farmers that these species sent to South Australia must be accompanied by a certificate regarding the freedom of the property of origin from infectious laryngo-tracheitis during the past twelve months, and that owing to the widespread nature of the disease such a certificate will not be given except in very special circumstances.

It is pointed out that birds consigned to South Australia unaccompanied by the appropriate certificate will be returned to the consignor and at his expense.

Although the existing regulations have been in force for more than a year, there are still numerous instances of infringements of this regulation.—W. L. HINDMARSH, Chief, Division of Animal Industry.

The Egg Export Season

Now that the export season is commencing the aim of all producers should be to forward the maximum number of clean eggs to the Board for export.

From time to time the main factors in maintaining clean eggs have been dealt with in these "Notes" and most farmers should by now be aware of the essentials for keeping eggs clean.

However, it may be of interest to learn that in Canada a very active campaign is undertaken to impress upon producers the necessity for keeping eggs clean.

The accompanying appeal is one of many which from time to time appear in the *Egg and Poultry Market Report,* which is issued weekly by the Dominion Department of Agriculture, Marketing Service:—

CLEAN EGGS

The Trade Mark of the Poultry Industry

Cleanness is the first criterion of quality.

Birds in nature lay clean eggs.

Eggs in the nests of wild birds are always clean.

Eggs that are not clean, therefore, must be man's responsibility.

What has man done to upset the equilibrium of Nature?

Many flocks produce dirty eggs because something is wrong somewhere.

The birds themselves may not be in a condition to lay clean eggs.

Cleaning eggs can become the most onerous job on the poultry farm.

Is it not time the Industry took stock of the situation?

Produce Clean Eggs—Not Cleaned Afterward

SAVE TIME . . . SAVE LABOUR . . . SAVE QUALITY

It is, therefore, not proposed to deal with the details at the present juncture, but anyone desiring further advice on the matter can obtain a copy of October, 1948, *Poultry Notes,* which deals with the subject.

Canada has a reputation for good quality eggs, both on the home market and in Britain, and there is no reason why we cannot equal Canadian standards if attention is given to essential details.

TRAVELLING stock were poisoned recently by eating quinine or Peruvian bush en route, warns the Stock Inspector at Warialda. Mint weed has also caused mortality in several mobs of cattle travelling along the Coolatai-Warialda-Croppa Creek stock route.

Mint weed has spread in the district with alarming rapidity, and will soon become a serious problem unless effective steps are taken to prevent further spread.

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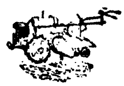

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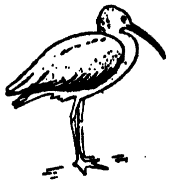

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THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

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Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)...	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.) ...	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus) A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jersey and Friesians)	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	33	21/6/49
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)...	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50
Perry, E. L., Shane's Park, via St. Mary's (Jerseys)	67	31/5/50
Police Boys' Club, Kurrajong	34	1/7/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus)	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	21/7/49
Scott, A. W. "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	42	30/5/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	165	1/7/51
Wollongbar Experiment Farm (Guernseys)...	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	64	21/5/50
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Barnardo Farm School, Mowbray Park ...	48	15/7/50
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus ...	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Co'ly, A. G., "Heatherbrae," Swanbrook Rd., Inverell	33	28/7/49
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	13	6/6/50
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell ...	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell ...	111	9/9/49
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	18	31/5/50
Grant, W. S., "Monkittee," Braidwood ...	20	2/7/50
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	53	1/6/51
Hart, K. H., Jersey Vale, Armidale ...	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale ...	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	31	27/7/49
Koyong School, Moss Vale	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell...	45	8/7/51
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, Estate E., "Bannockburn Station," Inverell	64	8/7/50
McGrath, B. J., Clyde Rd., Braidwood ...	31	13/8/49
McMillan, N., Duval Road, Armidale ...	32	8/10/49
MacNamara, B., "Mount View," Cessnock...	67	21/5/49
Marist Bros. College, Campbelltown ...	82	23/1/49
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows,", Keiraville ...	45	5/2/49
O'Brien, O., "Mount View," Inverell ...	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital ...	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell ...	22	14/5/49
Rolfe, C. D., "Rose Farm," Inverell ...	31	17/3/50
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	10	4/7/51
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead ...	30	9/7/49
State Penitentiary, Long Boy	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree ...	60	1/4/50
Tanner, F. C., Dural Rd., Armidale	42	8/10/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	'10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., "Spring Hills," Camden	61	7/12/49
Waddell, W., "Afton," Oakwood Rd., Inverell	125	8/7/50
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, "Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

The Ideal Bacon Pig.

THE ideal bacon pig should have light shoulders, a straight back of even width throughout its length, with the ribs well sprung, and long straight sides of moderate depth and in alignment with the shoulders and hams.

The hams should be fully developed down to the hocks; the belly should be straight in the underline; the flanks should be well filled, and the legs should be short and fine-boned.

Under normal conditions, young pigs can be marketed as baconers when six to seven months old, at which age the dressed weight of the carcase should run from about 130 to 150 lb., or from 185 to 210 lb. live weight—a desirable weight from the bacon factory's point of view.

For further information on producing bacon pigs for market, write to the Principal Livestock Officer (Pigs), Department of Agriculture, Box 36, G.P.O., Sydney.

The Pasture Scarab—*continued from page 434.*

Acknowledgments.

The Orange Golf Club kindly made available areas of fairway for the investigations, and the greenkeeper, Mr. R. Caldwell, has given much helpful information regarding the occurrence and habits of the larvae, observed by him over the past few years.

The writer is also appreciative of assistance rendered by Mr. J. M. Caldwell, of Borenore, on whose property life-history observations were carried out.

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[3] TWENTYMAN, R. L., PESCOTT, R. T. M.—1942: *Jour. Dept. Agr., Vic.* 40. 506-510, 512.

[4] WASON, E. J.—1932: Dept. Agr., N.S.W. Unpublished Report.

[5] ALLMAN, S. L.—1947: *Agr. Gaz., N.S.W.*, 58. 636-637.

Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Bathurst Experiment Farm (Ayrshires)	46
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	62
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Evans, C. A., & Sons, "Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	67
McEachern, H., "Nundi," Tarcutta (Red Poll)... ...	53
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	39
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalaluriga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	58
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	39
Rowntree, E. S., "Mourabie," Quirindi	75
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Training Farm, Berry (A.I.S.)	161
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm	54
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Callan Park Mental Hospital	44
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth ...	27
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	45
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	147
Royal Prince Alfred Hospital, Camperdown, "Yaralla" Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Sydney Church of England Grammar School	35

W. L. HINDMARSH, Chief, Division of Animal Industry.

Foreign Matter in Export Wool.

MORE or less regularly each year a general complaint is sent out from Bradford regarding the amount of foreign matter—principally jute fibres—which gets into the wool. This jute does not take the dye as thoroughly as wool, and as it cannot be removed beforehand, being so hard to distinguish, it has to be removed after the cloth is made.

Over £500,000 a year is the estimated cost of removing these deleterious fibres from the material.

There are three ways in which jute fibres can get mixed with the wool in the process of baling. When the woolpack is put in the press there are often found to be long strands of jute threads inside; these can easily be cut off and removed. It is a good idea to give the woolpack a shake outside the shed before putting it in the press.

Occasionally the corners of the pack are cut down slightly to make a neater bale. The short threads should be taken out of the corners of the bale, or they will get into the wool.

When sewing, if the ends of the threads are thrown carelessly on the floor they will probably be picked up with some of the wool and put into the press. A small bag should be hung near the press, and all these waste pieces of thread, etc., should be put into it to prevent them getting into the wool.—SHEEP AND WOOL BRANCH.

YIELDS of over 100 bushels per acre obtained at Yanco Experiment Farm this year, for the second consecutive year, from the grain sorghum varieties Caprock and Plainsman, provide ample proof of their inherent production capacity under irrigation, reported Mr. P. F. Stanton, Manager of the Experiment Farm, commenting on the 1948-49 sorghum investigations.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Bathurst Experiment Farm, Bathurst.
Boardman, C. O., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Draper, R. E., " Glengar," Capertee.
" Endeavour " Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., " Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Skarratt, A. C., Riverstone.
Wagga Agriculture College and Experiment Station.
Walker, J. R. " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Well-designed Piggeries Reduce Labour to a Minimum.

CAREFUL selection of the piggery site and careful design of layout are most important if pig raisers wish to reduce labour to a minimum.

The main consideration when choosing a site is that the land should have a gentle slope and natural drainage. For the same reason the soil should be light and sandy.

On dairy farms, no pigs can be kept within fifty yards of any milk room, bail or yard under the provisions of the Dairy Industry Act.

Many farmers have given little thought to design or layout of their piggeries, with the result that much time is lost and more work is required in attending to the pigs than should be necessary.

For more detailed information on systematic layout of piggeries, write to the Principal Livestock Officer (Pigs), Department of Agriculture, Box 36, G.P.O., Sydney.

Rye Grass Staggers in Sheep.

SEVERAL cases of rye grass staggers in sheep have been reported recently from the Orange district. Sheep affected have included ewes of all ages and lambs as young as two months, but the greater percentage of cases occurred in young animals.

This condition occurs on predominantly rye grass pastures, particularly when topdressed regularly. Although affected lambs may appear practically normal when undisturbed or when moved quietly, symptoms appear when they are driven at any pace. The hind limbs become stiff, causing a "proppy" gait, and finally do not function at all and the lamb falls over.

There is a generalised tremor of the head and body, an accentuated heartbeat and frothing at the mouth. After being down for a few minutes an affected animal may be able to get up again and move about quietly.

Only a small number of deaths have occurred from this condition. When affected animals were moved to other paddocks containing little rye grass, there was considerable improvement after three to four days and complete recovery within about ten days.—DIVISION OF ANIMAL INDUSTRY.

THE AGRICULTURAL GAZETTE FOR SEPTEMBER, 1949

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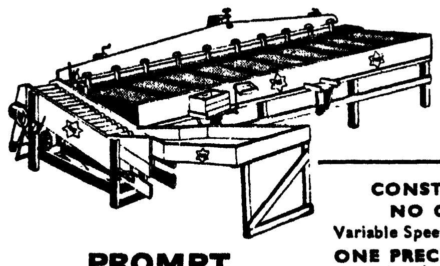

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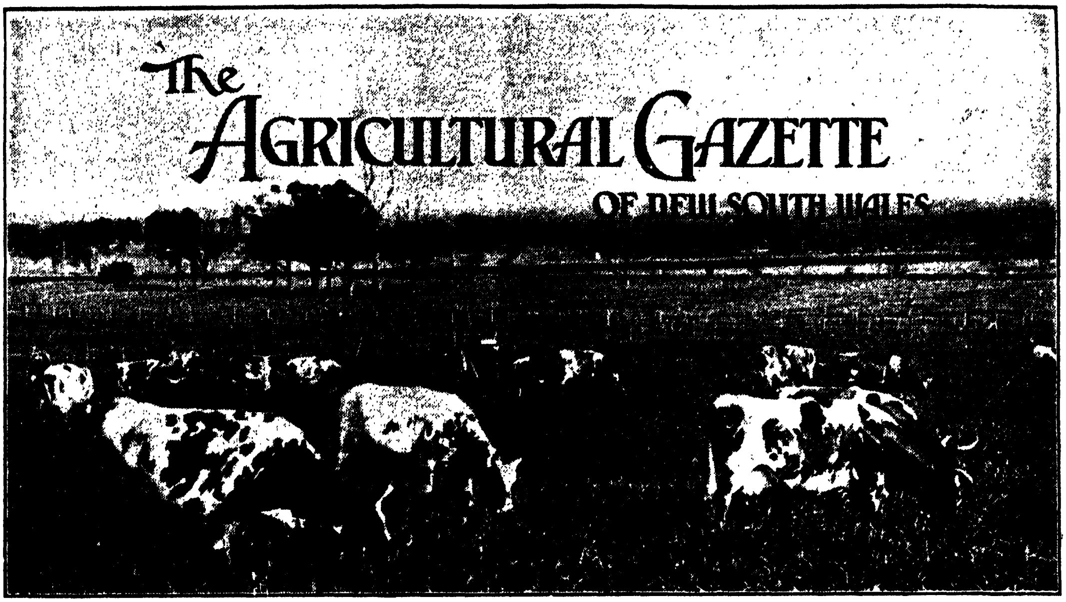


Editorial—

FLOOD LOSSES

DISASTROUS recent floods in coastal areas again draw attention to just how much producers and the State are prepared to accept as inevitable, destructive forces which could be largely, if not entirely, controlled.

On the Macleay alone, in last month's flood—apart from the tragic loss of life and the tremendous damage to towns and villages in the area—thousands of dairy cows were lost, to say nothing of the general upset to the dairying industry through loss of production, crops, pastures, fences, farm buildings and homes.

Such losses are appalling at any time, but doubly so at this particular time when the Commonwealth Government is in the middle of a five-year drive to increase dairy production—a plan involving expenditure of over a million pounds.

A most unfortunate feature of these flood losses is that they are recurring losses. They happened many times in the past; we can look with certainty to their happening again.

If they are unpreventable, then let us hope that producers are possessed of sufficient fortitude to continue to bear such a burden. But are these disasters unpreventable?

The job is not one of harnessing nature; it is one of conserving what nature bestows.

The immense quantity of water which flows down our coastal rivers to the sea following heavy rains now does little but damage. Conserved, it would provide feed and water sufficient to keep in production (and at a level of production higher than at present) double, perhaps treble, the number of milkers now carried.

Coastal irrigation schemes offer one solution, and in a doubly useful way. They would provide water for pastures, crops and stock during the dry months which occur almost every year in coastal regions. The oft-recurring dry spring months on our north coast take a very heavy toll of dairy production and make for instability in the industry.

Further, the damming of coastal rivers and their tributaries—for small-scale and large-scale irrigation schemes—would mitigate disastrous floodings on the lower rivers.

Each flood costs producers and the State hundreds of thousands of pounds. Multiply that by the number of floods experienced in the last twenty-five years, and contrast the wastefulness of that expenditure with the benefit which would have been derived, and the hardships avoided, by expenditure of the same vast amount on coastal irrigation schemes.

This country is one of immense resources, but they are not illimitable.

Refresher Courses for Ex-servicemen at Yanco Experiment Farm.

THE following eight-week refresher courses in the principles of farm management have been arranged by the Department of Agriculture and will be held at Yanco Experiment Farm on the following dates:—

No. 12 Course: 19th September to 11th November, 1949.

No. 13 Course: 9th January to 3rd March, 1950.

Applicants must be in possession of a Qualification Certificate, or be recommended for a Refresher course by the Classification Committee, War Service Land Settlement, 132 George street North, Sydney.

Application to attend should be made to the Deputy Co-ordinator, Rural Training, New South Wales Department of Agriculture, Box 36A, G.P.O., Sydney.

The specialist is provided for by dividing the course into the following specialist groups, each of which has its own syllabus and special instructor, and is conducted in conjunction with the general syllabus:—

Group 1.—Sheep, fat lambs and mixed farming.

Group 2.—Dairy and pig-raising.

Group 3.—Horticulture.

Group 4.—Poultry.

When making application, prospective trainees should indicate the specialist group they wish to join.

Full use is made of the opportunity to visit various stud properties, soil conservation stations, experiment farms, etc., and the lectures are supplemented by the use of films and other visual instruction aids.

Office and Staff Quarters at Yanco Experiment Farm.

These courses are not designed to instruct the beginner, but to provide the experienced farmer or grazier with information as to the latest developments, research and scientific methods that became accepted while he was serving with the Armed Forces.

Instruction is provided in elementary agricultural economics and farm management, together with refresher lectures and demonstrations on many agricultural and veterinary subjects and practices. Arrangements have also been made for special instruction in wool classing.

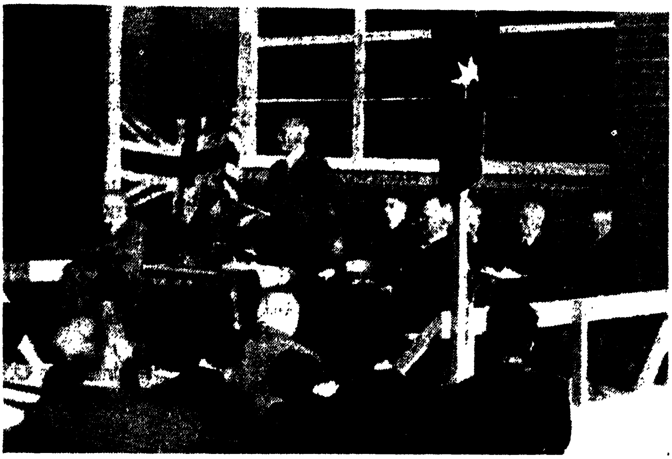
The Department of Agriculture has made available its best instructors for these courses. These officers are in close contact with the student and are ready to help and advise each student with his individual problem.

Upon completion of the course students will be issued with a document by the Department which will include reports on the specialist subject taken by the student.

Allowances are paid to the trainees whilst attending these short refresher courses, also free rail travel is provided to and from the training centre.

NEW CANNERY AND PACKING SHED

At Hawkesbury Agricultural College Officially Opened



The Official Party at the Opening Ceremony.

With the College Principal, Mr. E. A. Southee (standing), are Hon. W. F. Sheahan, M.L.A.; Dr. R. J. Noble, Under Secretary and Director; Mr. C. G. Savage, Chief, Division of Horticulture; and representatives of the canning trade.

THE official opening, on 29th July, of a modern cannery and packing house at Hawkesbury Agricultural College marked the culmination of activities by the Department of Agriculture, over many years, designed to provide students with instruction in up-to-date methods of packing, processing and preserving fruit and vegetables—and also to provide facilities for research work in connection with the canning industry.

In the absence, through illness, of Hon. E. H. Graham, M.L.A., Minister for Agriculture, the ceremony was performed by Hon. W. F. Sheahan, M.L.A., who is acting as Minister for Agriculture.

Many representatives of the canning industry and associated research organisations assembled for the occasion, the visitors being welcomed by Mr. E. A. Southee, Principal of the College.

Welcome by College Principal.

Almost since its establishment in 1891, said Mr. Southee, the College had taken a lead in the processing of foodstuffs. As early as 1896 preserved fruits and vegetables and dried fruits prepared at the College had been exhibited at metropolitan and country shows. In 1900 a large packing shed was erected with increased facilities for jam-making and the canning and bottling of fruit. Fruit had even been sent overseas for exhibition. The College had been interested in the development of the processing of passionfruit and in the production of banana "coffee."

Situated as it was in the heart of a fruit and vegetable production area, the College had done much work in the breeding of improved varieties of fruit and vegetables for food processing. Recent developments in the technology of fruit and vegetable processing and preserving had led the Department to establish the new cannery.

At the beginning of 1949, said Mr. Southee, the Department inaugurated a three-year Diploma Course in Horticulture, in which students after taking a general course in agriculture for the first two years specialised in the third year in horticulture. Subjects studied included advanced horticulture, elementary principles of food technology, horticultural botany, entomology, and plant pathology, horticultural economics and organic chemistry. This course enables students to take up positions as orchardists,

field officers with canneries and other industries associated with horticulture, and as officers in the Department of Agriculture.

A Diploma Course in Food Technology was now projected. This would be of two years duration and the subjects studied would include principles of food technology (fruit and vegetables), crop production, biochemistry, engineering, microbiology, nutrition, food industry economics, applied botany and entomology, business principles and book-keeping. The necessary basic sciences would be taught in first year. Training would be given in the canning and dehydration of fruit and vegetables. It was intended to introduce quick freezing as soon as the necessary equipment was obtained. The main object of the course was to train students for positions as managers, technologists, supervisors or foremen.

The College now had ideal facilities for all this special training in horticulture and in the processing and preserving of fruit and vegetables, said Mr. Southee. It comprised 40 acres of orchard and had extensive vegetable gardens under spray irrigation, a full range of up-to-date machinery in the modern cannery and packing house, complete laboratory facilities and a highly-trained and experienced staff.

To co-ordinate research in relation to canning problems by C.S.I.R.O. and the College cannery, a committee with representatives from C.S.I.R.O., the Sydney University and the N.S.W. Department of Agriculture had been set-up.

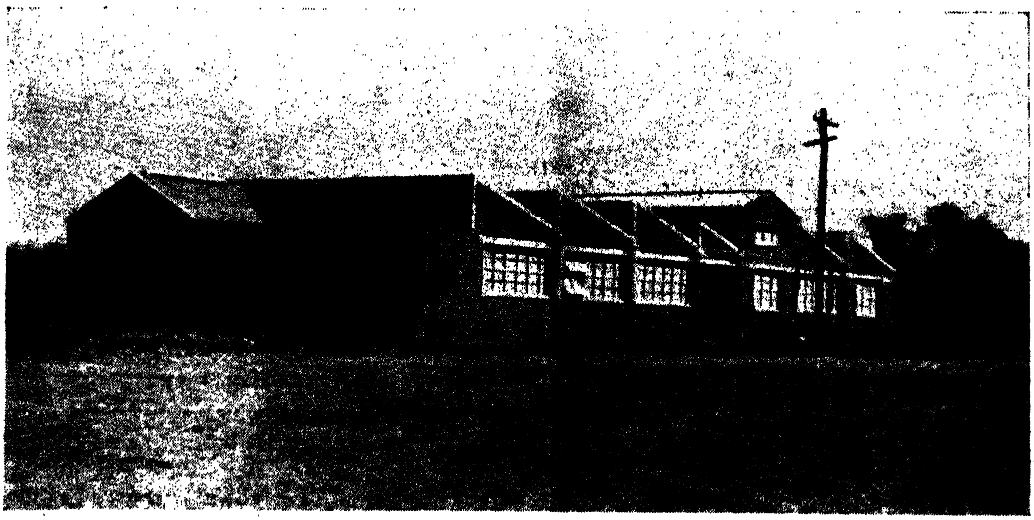
The production of canned fruits reached a record level in 1948 and was causing some concern to processors, as it was necessary to export between 60 and 70 per cent. of the pack, Mr. Southee said. This meant that our canned products must compete on the world's market with those of other countries, principally the United States. To maintain our overseas markets, every endeavour was necessary to produce the highest quality product which could be sold at prices comparable with that of our competitors.

Cannery Officially Opened by Hon. W. F. Sheahan, M.L.A.

In declaring the cannery officially open, Hon. W. F. Sheahan, M.L.A., acting Minister for Agriculture, apologised for the absence of the Premier, and of the Hon. E. H. Graham, M.L.A., Minister for Agriculture, who was unfortunately prevented by illness from being present and performing the ceremony.

The cannery, said Mr. Sheahan, would enable the training of students in the most modern methods of cannery practice, to the great advantage of the industry.

In the orchard and vegetable garden at the College the growing and breeding of new varieties was being undertaken to ascertain whether they possessed any special qualities



A General View of the Cannery.

above those now grown commercially, Mr. Sheahan said. The Department of Agriculture was also very active in other spheres of research and investigation relating to the canning industry and to fresh fruit preservation. New varieties of canning peaches grown by the Department on the Murrumbidgee Irrigation Area and processed by commercial canneries were kept under examination, planting and production trends on the Area were closely watched and in co-operation with C.S.I.R.O. canning tests were made with vegetable varieties.

Problems associated with the storing and transport of fruit and vegetables in the fresh state were being undertaken also in co-operation with C.S.I.R.O. The Government believed that the method of quick or snap freezing of foodstuffs had great possibilities in this country, and recently an officer of the Division of Horticulture of the Department of Agriculture had been sent to America to study new developments in relation to that system. Also a citrus research laboratory had recently been erected at Gosford, and the construction of several additional research stations had been approved.

Mr. Sheahan paid a tribute to the training given in the past at the College in all aspects of agriculture, and particularly to the work of the College Principal. This new venture, he said, would enlarge the scope of activities by enabling more advanced training of students as food preservation technicians.

The High-speed Rotary Cooker Installed in the Cannery.

This equipment was designed by Messrs. L. J. Lynch and R. S. Mitchell, Officers of the Canning Section of the C.S.I.R.O. Food Preservation Laboratory, Homebush.

The principle on which it operates is used overseas for cooling cans, but this is the first instance in which it has been used for cooking.

Co-operation of the Canning Trade.

The vote of thanks to Mr. Sheahan was moved by Mr. F. S. Bradhurst, President of the Food Technology Association of N.S.W. He said that there was an obvious need for technically-trained operators in food factories. Efforts had been made, in the past, to meet this need by the establishment of courses at various centres, but it had not been adequately met because the courses had not been properly designed. The equipment at the College and the course planned would serve the needs of Australia for technically-trained staff for some time to come. The assistance of the Association would gladly be given in operating and modernising the course to meet any changes in the needs of the industry.

Mr. H. V. Smith of Batlow Co-operative Packing House, and Mr. Max Edgell of Gordon Edgell & Sons Ltd., expressed the pleasure of the canning trade in co-operating with Hawkesbury College and the Department in the canning project. The canneries who contributed to the display staged in the new cannery at the official opening and the officers of C.S.I.R.O. who assisted in the establishment of the cannery were thanked by Mr. C. G. Savage, Chief, Division of Horticulture of the Department of Agriculture.

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Cowra	September 13, 14
The Rock (O. L. Boyd and A. F. Walker)	September 17
Canowindra	September 20, 21
Eugowra	September 27, 28
Leeton (E. C. Tweedie)	September 30, October 1
Albury (A. G. Young)	October 11, 12, 13
Kyogle	October 12, 13
Lismore (North Coast National)	October 19, 20, 21, 22
Alstonville	October 27, 28
Murwillumbah	November 2, 3
Mullumbimby	November 9, 10
Bangalow	November 16, 17
Nimbin	November 24, 25

1950.

Lithgow (S. J. Williams)	February, 3, 4
Paterson (S. M. Reynolds)	February 9, 10, 11
Pambula	February 10, 11
Candelo	February 17, 18
Cobargo	February 22, 23
Newcastle (P. G. Legoe)	February 22, 23, 24, 25
Dorrigo (H. S. Doust)	February 24, 25
Bega (J. Appleby)	March 2, 3, 4
Delegate	March 8, 9
Gundagai (J. C. Sattler)	March 14, 15
Bombala	March 15, 16
Coonabarabran (M. J. Hennessy)	March 16, 17
Cooma	March 21, 22 (or 22, 23)
Dungog (M. Riordan)	March 24, 25
Moruya	March 24, 25

Approved Vegetable Seed, September, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop, must bear the number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (H.B. 49/5)—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Rouge de Marmande (H.R. 49/1)—H. P. Richards, "Sovereignton," Tenterfield.

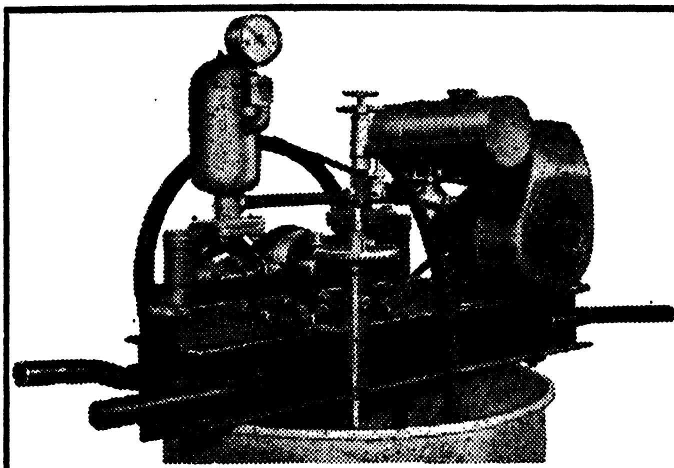
Red Cloud (H.R. 49/2)—H. P. Richards, "Sovereignton," Tenterfield.

Marglobe (H.R. 49/3)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 49/4)—H. P. Richards, "Sovereignton," Tenterfield.

THE *Agricultural Gazette* is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.



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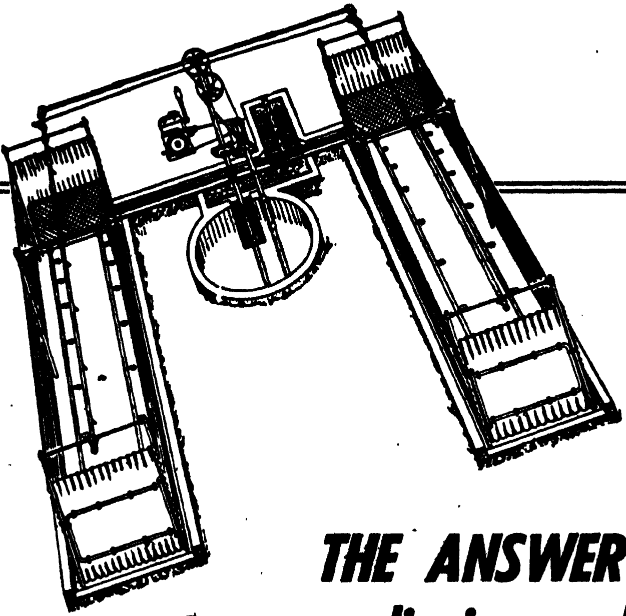

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The Provision of—

FODDER FOR STOCK

—In the Orange, Bathurst and Molong Districts—

(*Continued from page* 404.)

●

R. C. MADSEN, H.D.A., District Agronomist.

TO maintain the production and disease resistance of their stock during the winter, as well as during droughts and in times of temporary shortage, farmers and graziers of these areas must practise supplementary feeding.

It is the purpose of this article to describe the methods of growing and using the many suitable species of pasture and fodder plants, not only to produce, on the farm, an ample supply of feed for every month of the year, but also to build up the fertility of the soil.

This third instalment discusses the growing of fodder crops—previous instalments in July and August issues having dealt with the general principles of management and with the establishment and utilisation of pastures.

FODDER CROPS.

Fodder crops are essential for supplementing pastures, and greater use of them should be made.

Seed-beds should be prepared thoroughly and sowings made at the correct times and in the correct manner in order to achieve the maximum benefit. When grazing crops, it is preferable to graze off quickly with a large number of stock rather than with a small number for a longer period.

Grazing when the ground is wet should be avoided and stock should be taken off sufficiently early if the crop is required for either grain or hay.

WINTER FODDER CROPS.

Oats.—Oats is probably the most popular and valuable winter fodder crop for both Tablelands and Central Slopes. It is ideal for a rotation as it is not susceptible to the diseases of wheat; it recovers well after grazing; it may, if necessary, be sown on areas where workings have been through necessity, on the rough side, and it may be sown also economically on wheat stubble.

Continuous grazing of pregnant ewes on cereals, particularly oats, may bring about losses from mineral imbalance, and rotational grazing is necessary to assist in overcoming this trouble.

Grazing of oats may be commenced within six or eight weeks after sowing, thus providing early feed. Oats provide relief to the heavy grazing of pastures; they may be grazed completely if not required for hay or grain, or to top off lambs when grass seed is a nuisance in pastures.

Sowing should be made in March and April, either alone or in conjunction with pastures, at the rate of 50-60 lb. per acre (the heavier sowings on the Tablelands), but at 40 lb. per acre when used as a cover crop. The importance of early sowing cannot be over-stressed since it ensures good root development.

Ready response is obtained by the application of ¾-1 cwt. of superphosphate, the heavier applications being required on the Tablelands. Sowing with a combine, into pastures, of 25 lb. of oats together with 1-2 lb. of Wimmera rye grass and 1 cwt. of superphosphate will provide excellent winter grazing. The ensuing crop should be allowed to shatter to provide better summer grazing.

The recommended varieties of oats are:—

For grazing only on both Tablelands and Central Slopes—Fulghum.

For grazing, grain or hay on Tablelands—Algerian, Lampton and Brigalow.

For grazing, grain or hay on the Central Slopes—Algerian, Belar.

Swedes.—Swedes are a most valuable crop for winter grazing on the Tableland areas only. Good crops have a carrying capacity of ten to twelve grown sheep per acre from June to early October, the period when Tableland pasture growth is very slow. Swedes are suitable for cattle, but care should be exercised to see that choking does not occur.

A Crop of Swede Turnips for Grazing Purposes.

Root crops are good in a rotation, being excellent cleansing crops. The cost of establishment of swedes is low, provided a well prepared and reasonably fine seedbed is available. Sowing should be made between mid-December and mid-February to a depth of only ½ to 1 inch. Superphosphate is necessary at the rate of 1½-3 cwt. per acre.

For a successful germination, the crops should be sown after rain, as compaction after sowing may result in a poor germination. Sow 1 to 1½ lb. of seed of Champion Purple Top per acre.

Portion of the crop can be marketed early if the price warrants the heavy harvesting labour costs involved.

Although swedes contain 90 per cent. water, the dry matter is extremely digestible and accounts for the splendid results obtained and the small amount of digestive trouble with stock feeding on them. They should not be fed whole to dairy stock but grazed—after milking to avoid tainting. If used for stall feeding swedes should be chopped up.

Sheep and cattle will fatten even when fully grazed on the crop, but best results are obtained when stock are given a change or are allowed access to dry feed, pasture or grazing oats.

Rape.—A cheaply established crop for Tableland areas for winter grazing is rape, which may be sown alone or with a cereal. If with the latter, the rate of seeding of the cereal should be reduced by a little over half of the normal rate of seeding.

Rape makes very rapid growth and will carry large numbers of stock. Care should be exercised not to graze too closely and, owing to the possibility of hoven, the crop should not be eaten too quickly. Stock should be broken in gradually and have access to roughage or pasture.

Seed of the Dwarf Essex variety should be sown at 3 lb. per acre, ½ to 1 inch deep with 1 to 1½ cwt. of superphosphate per acre. Sowing should be carried out after early autumn rains—March for preference, and possibly earlier on the Tablelands. Early sowing is essential for success.

Rape has proved very successful on reasonably fertile soils which have been thoroughly prepared; it is a very hardy crop and able to withstand fairly severe frosts. It is relished by all stock, but taints milk slightly, and so should be grazed by milch cattle after milking. It is not only capable of carrying large numbers of stock, but in the opinion of butchers rape-fattened stock kill particularly well.

Initial grazing may be made about two months after sowing, when the crop is 9 to 12 inches high.

Rye.—Rye is a quick growing crop, but is not very extensively grown. It is confined to the colder parts of the Tablelands, on the poorer soils, and where oats give indifferent results.

Rye provides a good supply of feed but is not relished by stock and does not provide as much bulk as oats.

The Black Winter variety should be sown at the rate of 50 lb. per acre with 1 cwt. of superphosphate, preferably in February-March. Grazing should be possible within eight weeks of sowing and the crops should be grazed right out and not cut for hay.

Wheat.—Wheat crops do not stand grazing nearly as well as oats. However, it is often necessary to graze wheat off, particularly if early growth should be checked. Such a grazing should be for as short a period as possible, as it will often have a detrimental effect upon the ultimate grain or hay yield. Wheat crops should not be grazed any later than early July on the Slopes or end of July on the Tablelands.

As grazing of wheat is of secondary importance, early-sown varieties, such as Bordan, Ford and Celebration, usually sown for grain and hay, are used.

Barley.—Owing to the popularity and value of oats, barley is seldom sown for grazing but rather permitted to run through to grain. Barley for grazing is most valuable when early autumn feed is required.

SUMMER FODDER CROPS.

Japanese Millet.—Although greater success with this crop is experienced on the Tablelands than on the Central Slopes, excellent grazing is obtained on the Slopes provided frequent summer showers are received, as the crop is not dry weather-resistant.

The many good points of this crop are unfortunately not fully appreciated. It is a rapid grower and may be grazed or cut for silage, for which purpose it should be cut when in head but before the grain is well formed. It may be grazed at any stage of growth, but is best when 6 to 8 inches high, at which time its food value is comparable with winter cereals. However, Japanese millet should not be allowed to grow too high before grazing.

Succulent green feed is provided in considerable bulk from late spring to autumn, but frosts will terminate growth and seriously reduce the nutritive value. The crop has a definite stimulating effect upon milk production, recovers well after grazing and responds very well to light showers. It is essential that the seed be purchased from reliable sources to ensure freedom from poisonous mint weed seed. It should be sown on a thoroughly prepared seed-bed after rain.

Owing to the susceptibility of the crop to frosts, sowing should not take place before late September and may be continued to December provided seasonal conditions are satisfactory. The sowing rate is 6-8 lb. per acre on the Slopes and 9-10 lb. per acre on the Tablelands, with ¾-1 cwt. of superphosphate.

Sudan Grass.—The merit of this fodder is its drought-resistance, but it only thrives under warm conditions and will not give satisfactory results in cold localities; therefore it is suited to the Central Slopes only and is better than Japanese millet in such areas.

Growth is rapid, and although it is usually grazed off, there is a definite risk from poisoning up to the time of heading, particularly where sorghum hybrids are present in the crop. Care should also be exercised in grazing when young shoots are formed during a dry spell and when young growth is made as a result of rain following a dry spell. Sudan grass is chiefly used for sheep grazing and should not be used for dairy cattle.

Seed should not be sown until the end of September, and then only if the soil is warm, as the crop is susceptible to frost.

Roots of Three Varieties of Swede Turnips.
Roots as well as tops are eaten by sheep.

November sowings may be made if sufficient moisture is present. Sow at 8-10 lb. of seed per acre, with ¾-1 cwt. of superphosphate per acre.

Maize.—Although maize is a particularly palatable fodder and capable of reasonable yields under favourable soil and climatic conditions, neither the Central Tablelands

nor Central Slopes conditions seem to suit the crop. However, it may prove successful in some localities on the better soils in some years, and may be worthwhile growing on a limited scale, but Japanese millet and Sudan grass would be more suitable.

Care should be exercised when growing maize in the Bathurst district as certain areas have been quarantined indefinitely owing to the presence of American Boil Smut, which periodically makes its appearance.

Sowing should be made after frost danger (late September-October or even early November) in drills approximately 4 feet apart at the rate of 10-15 lb. per acre, with 2 cwt. of superphosphate per acre.

The recommended varieties are:—

For grain.—Early Morn, Golden Glow, Wellingrove.

For grain, fodder and silage.—Funk's Yellow Dent, Wellingrove, Hickory King, Iowa Silvermine.

Miscellaneous Crops.—Surplus quantities of vegetables, such as potatoes, carrots, pumpkins, cabbages and cauliflowers should not be allowed to waste but rather be fed to stock.

Owing to the possibility of tainting they should not be fed prior to milking and watch should be kept for material that has been sprayed or dusted late in growth with arsenate of lead.

Potatoes, which are often in plentiful supply, are generally regarded as being of high nutritive value. They are readily eaten by sheep in the paddock, but green or sprouted potatoes, if eaten, may prove poisonous, especially to horses. Potatoes should be fed in small amounts only for a start, the quantity being gradually increased. As they are very low in protein, the stock should be given protein-rich feed.

(To be concluded.)

Use of DDT and HETP Sprays Against the Green Vegetable Bug.

DURING the late summer months, the green vegetable bug (*Nezara viridula*) can become a serious pest of beans and tomatoes, and occasionally of other crops. Control by the egg parasite, *Microphanurus basalis*, is not always effective, and direct methods must be used. With this in mind, some of the newer insecticides were tried against this pest in January and February of this year.

In tests in the laboratory, DDT, HETP (hexaethyl tetraphosphate) and E605 (diethyl ester of paranitrophenyl thiophosphate) sprays were very effective, and it was determined to investigate these further in the field.

At Mascot, HETP and DDT were tried against adult bugs caged over small spinach plants growing in the field. HETP was used at 1/1,000 and 1/2,000, with and without a suitable wetting agent in both cases, and DDT was used at 0.1 per cent. Thorough applications were made with a knapsack spray pump.

At 1/2,000, HETP was ineffective in killing the bugs; at 1/1,000 it gave good results, but was not as effective as 0.1 per cent. DDT.

A similar trial was carried out on bean plants growing in the Insectary grounds, with DDT (0.1 per cent.), HETP (1/1,000, with and without a wetting agent) and E605 (1/5,000).

In this test, neither HETP treatment was as effective as DDT or E605, both of which gave very good results.

It was noticed that DDT was somewhat slow in its action; in each test several days elapsed before DDT treatments were fully effective. Despite this, 100 per cent. kill was obtained with 0.1 per cent. DDT emulsions in almost every case, and it is felt that thorough applications of this spray will give satisfactory control of the green vegetable bug.

Four fluid oz. of a 20 per cent. DDT emulsion to 5 gallons of water will make a 0.1 per cent. emulsion.—J. G. GELLATLEY, Assistant Entomologist.

TRIALS carried out at the New England Experiment Farm, Glen Innes, over the last few years, have amply demonstrated the value of ploughing poor *Phalaris tuberosa* pastures during late autumn, reports Mr. F. C. Fletcher, Agronomist, stationed at the New England Farm.

The Farm trials showed that renovation, subsequent harrowings and surface seeding with Red and White clover, together with application of superphosphate, greatly increases the carrying capacity of these pastures.

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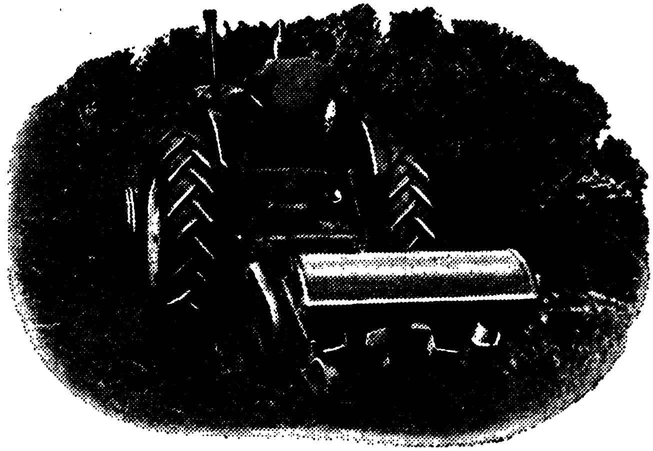

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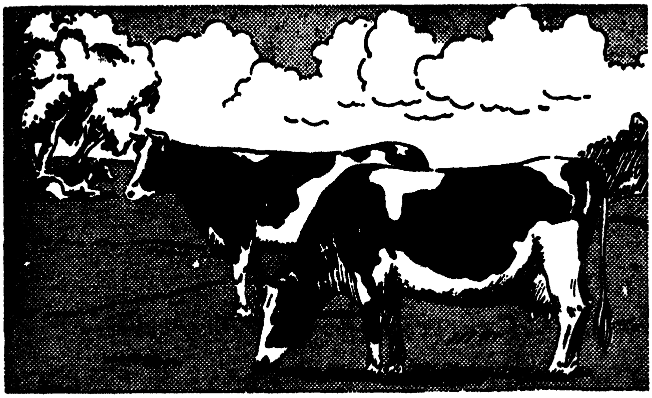

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

THE WORLD SUPPLY OF FOODSTUFFS IN 1948

ACCORDING to estimates by the Food and Agriculture Organisation, the supply of foodstuffs for the world as a whole (exclusive of U.S.S.R.) during 1947-48 was about the same as in the preceding year—approximately 96 per cent. of the pre-war average (1934-1938). However, it must be remembered that between the outbreak of World War II and 1947 the world's population increased by approximately 200 million—from 2,120 million pre-war to 2,320 in 1947. Hence consumption per head was considerably below pre-war levels. For the world as a whole, average consumption of food per head in 1947-48 was 12 per cent. below pre-war levels.

But this average world figure is somewhat misleading because it does not show the variation in the deterioration of per capita consumption in different areas. This variation, both from the overall average and as between areas, was considerable.

Relatively, the decline in European consumption was the greatest; in 1946-48 food consumption per head in Europe (excluding the U.S.S.R.) was down by 27 per cent., compared with pre-war levels. In the Far East, already on an extremely low average food intake per head before the war, consumption per head during the war years fell by another 16 per cent.; in 1947-48 there was a slight improvement, consumption per head rising by about 3 per cent.

The following table gives index numbers of total and per capita supplies of food available for consumption in different areas, and of the volume of production for 1946-47 and 1947-48. Figures for 1934-38 are 100 in each case—so that the index number measures the relative changes which have taken place in production and consumption in these areas.

WORLD SUPPLY AND PRODUCTION OF FOOD—1946-47 AND 1947-48.

Area.	Supply.				Production.	
	Total.		Per Head.			
	1946-47.	1947-48.	1946-47.	1947-48.	1946-47.	1947-48.
Far East	92	92	84	87	90	93
Europe (excl. U.S.S.R.) ...	77	75	73	73	76	74
U.S.A. and Canada ...	126	122	112	108	135	129
Latin America	119	127	96	102	114	120
Australia and New Zealand	108	110	94	96	96	111
World average (excluding U.S.S.R.)	95	96	86	88	95	96

Of course, these areas are not all of equal relative importance. Before the war, the Far East produced 35 per cent. of the total world food production (excluding the U.S.S.R.), whilst the relative shares of the other areas were as follows: Europe, 33 per cent; United States and Canada, 18 per cent.; Latin America, 8 per cent.; Australia and New Zealand, 2 per cent; Africa and the Near East 4 per cent. Last year, United States and Canadian production had expanded to 25 per cent. of the total, whilst European production had dropped from 33 to 25 per cent. Latin American production increased to 10 per cent. and Australian to 3 per cent. of the total.

It must be remembered that these figures relate to total production and not to exports. This explains the comparatively low Australian and New Zealand figure; as a percentage of world exports the share of Australia and New Zealand increased from 10 per cent. pre-war to 11 per cent. in 1947-48.

Bread Grain Production Normal.

Changes also occurred in production of foodstuffs when grouped into major types of products. Thus bread grain production in 1947-48 was estimated by the Food and Agriculture Organisation at approximately 10 per cent. higher than pre-war, and similar increases have taken place in the production of coarse grains. The production of rice, on the other hand, is barely back at the pre-war level, despite increased production outside of Asia, namely, in Egypt and the Western Hemisphere. The output of rice in Asia—which produces and consumes 90 per cent. of the world's rice—was below pre-war levels. As a result of this decline in local production, several food-deficit countries in Asia have found it necessary to import large quantities of wheat and rice from the Western Hemisphere and Australia.

World production of fats and oils during 1948 is estimated to have recovered to approximately the pre-war levels, but in most European countries and Asia (except the Philippines) it was considerably below pre-war. The sugar situation changed during 1947-48 from one of shortages and allocations to one raising fears of future surpluses. World production was above the pre-war level and the production of Cuba—the largest exporter—was more than twice the pre-war level. In Europe output was still only two-thirds of pre-war production.

The production of milk and dairy products has declined slightly in the last twelve months, and while the supplies of livestock products in general were considerably better in 1947-48 than one year earlier, they were still about 8 per cent. below pre-war production. Increased supplies of feed grains in 1949 will probably result in a slow increase in livestock products.

About the position of Australia and New Zealand the latest F.A.O. bulletin has this to say: "Both Australia and New Zealand still offer great possibilities for a considerable increase in production, but at present meat and dairy products (the production of which could be expanded most easily) represents for most of the food-importing countries, luxuries which they cannot afford to buy in large quantities. The extent to which these possibilities will be utilised in the future depends largely on the success of the European Recovery Programme in promoting the economy of Europe and the United Kingdom."

Consumption Per Head is Still Below Normal.

Summing up the present position, the Food and Agriculture Organisation makes the following comment: "Total world food production is approaching pre-war levels; but, owing to the population increase, average consumption per head is still below pre-war. The pre-war average was grossly insufficient to provide for nutritional needs; and now there is a more marked disparity between countries, and consumption has risen above pre-war mainly in those countries where it was already high.

"With the gaining of political independence in a number of under-developed countries, their people will demand and expect improved standards of living. With little relief from present low standards immediately in sight, political instability and civil unrest may well increase rather than decrease."—F. H. GRUEN, Economic Research Officer.

The United States Research and Marketing Act

IN 1946 the United States Congress passed the Research and Marketing Act, which provides the statutory basis for a greatly expanded programme of research in both natural and social sciences, with a view to assisting and improving the production and distribution of farm products in the United States, and thus to improve the living standards of the American farmer. In this article a brief outline of the purpose and accomplishments of this Act is given, because it is believed that attempts in other parts of the world to increase the efficiency of the production and distribution of farm products may be of interest to farmers in Australia.

Originally it was intended under this Act to spend 9½ million dollars (£A3 million) on marketing and production research in 1947, and that the sums to be spent in future years were to increase gradually until, in 1951, 61 million dollars (£A19 million) were to be spent on research. In actual fact it has been found that shortage of trained personnel and other difficulties have reduced the amount of research which can be undertaken, and during 1948 only 9 million dollars (£A2.8 million) were spent; in 1949 it is expected that over 13½ million (£A 4.2 million) will be spent.

These amounts are, it should be stressed, devoted to research in addition to all the other funds granted by the Federal and State governments in the United States towards research into fundamental problems of American agriculture. This attempt represents the largest single research programme in agriculture ever established in the United States—or, for that matter, probably anywhere else.

How are these large funds to be spent? There are three headings under which funds can be made available. A large section of the funds is to be devoted to research to develop new and expanded uses for agricultural products; another section is to be devoted to marketing research to improve the efficiency of the marketing system in the United States on the assumption that such improvements in marketing will increase the share which the American farmer obtains from the consumers' expenditure; finally, funds are set aside for research into basic laws of agriculture, nutrition, soil conservation, etc.

It would be impossible to mention all the different projects which are being undertaken under this Act. The mere enumeration of projects in hand takes up over twenty closely printed pages in the Annual Report of the Department of Agriculture for 1948. Here only brief mention will be made of some of the projects which may be of greatest interest to Australian primary producers.

Research on fruits and vegetables is allocated substantial amounts. Among the fruit and vegetable projects are: to determine the most effective means of increasing the efficiency in marketing peaches, reducing costs and margins and improving the quality of peaches when they reach the market; and "to increase returns to tomato growers and provide a better product to consumers by developing improved methods of packing and marketing tomatoes."

To improve returns for dairy farmers, one project sets out to assemble and analyse information which should assist in the development of new markets and outlets for milk and dairy products, particularly for products that are expected to be in excess supply. Another dairy research project has as its objective to find out why milk and cream deteriorates when frozen or refrigerated, as a basis for determining how to retain the freshness of these products over a longer period of time; also to get detailed data on how milk can be preserved through freezing so that supplies from flush production periods can be kept in acceptable form for periods of short supply.

In the field of wool, one project is: to study the possibilities of modifying United States wool characteristics so that "they will compete more favourably with foreign wools and synthetic textile fibres." Another wool project is to develop new industrial uses for wool grease and other wool by-products. A third project, on the economic

side, is to investigate "what measures are feasible for improving the competitive status of domestic *versus* foreign wools."

It should be stressed that the projects described here have been singled out quite arbitrarily, not necessarily in order of importance, but just to give some idea of the sort of problems which are being tackled by research under this Act. It would be too early to expect any large results from the research work already undertaken, but according to the 1948 Report, remarkable results have already been achieved in some fields. A vaccine for Newcastle disease in poultry has been developed and proved very effective in experimental field tests. A method to improve the keeping qualities of pre-packaged fresh vegetables has been found, which enables cauliflower and brussels sprouts to be kept more than eight days as opposed to the usual time of four days. Studies have been made in sixteen cities which show that the man-hours used in the physical handling of perishable farm products could be tremendously reduced if labour-saving equipment and efficient operating methods were used. In one instance it was found that thirty man-hours were required to unload a railway car, whereas in another, involving a new warehouse and modern mechanized equipment, unloading time for a comparable car was cut to one and a half hours.

Commodity specialists have been sent to a large number of foreign countries to make first-hand studies of potential markets. At least twenty reports have already been issued pointing out possible markets for United States cotton, fresh fruits, tobacco, seed potatoes, rice, etc.

These results are only a very small section of what can be expected when this research programme gets into its full stride, but they do indicate the vast resources allocated to research in the United States and the determination of American research workers to improve the production and marketing of American agricultural products.—F. H. GRUEN, Economics Research Officer.

World Census of Agriculture

EVERY farmer knows that it is occasionally worthwhile to stop and take stock of where he is, to see whether he is getting ahead or lagging behind and to figure out what changes, if any, he ought to make to his farming operations. Similarly, nations need to take stock of their agricultural resources and production.

In Australia a large amount of valuable agricultural information is collected annually by the various State and the Commonwealth Statisticians, and approximately once every ten or twelve years a Census of Population is taken. But just to count people is not enough; we also need to know something of what they are doing. In some countries, such as, for instance, the United States, a Census of Agriculture is taken every five years, and many other countries take a census of their agriculture regularly.

With agriculture upset in many parts of the world, there is now, more than ever, need for a world-wide stocktaking in agriculture. Accordingly at a conference in Copenhagen in 1946 the nations which are members of the Food and Agriculture Organisation of the United Nations asked F.A.O. to take the lead in developing plans for a World Census of Agriculture, to be taken in 1950. F.A.O. will help those countries which have not had a census for many years, or those which have never had one, to work out the details, but each country will be responsible for taking its own census. If all countries work together it will be possible to add up the results and get a world-wide total for some of the major agricultural items.

As a first step F.A.O. has developed a preliminary programme for the 1950 World Census and has sent that to governments asking them to look it over and tell F.A.O. how it fits into their own plans. Information which it will be attempted to obtain includes such items as whether farms are owned, rented or managed, the size of farms, the amount of land used for growing crops, orchards, pasture, forests and for other uses; the number of people living

(*Continued on page* 484.)

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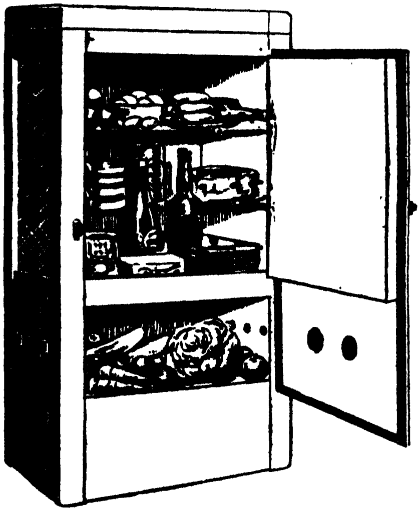

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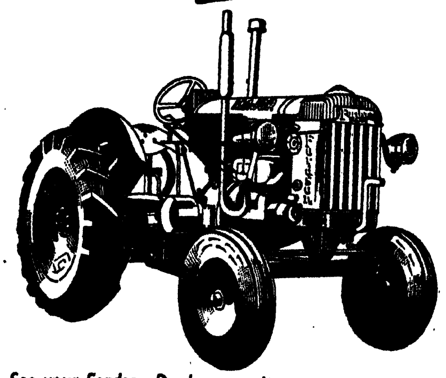

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Making Efficient Use of Fuel in

FARM TRACTOR OPERATION

J. E. HUNT, A.M.I.A.M.E., Farm Mechanisation Section.

SUCCESSFUL application of mechanisation to agriculture is primarily dependent on the efficient operation and maintenance of suitable equipment.

With farm tractors, fuel economy is of prime importance. Careful attention to the servicing and maintenance of a farm tractor is undoubtedly the obvious way to obtain the maximum power output from the minimum quantity of fuel consumed. Incorrect service and maintenance leads not only to excessive fuel consumption, but also to costly repairs and to delays while awaiting replacement parts.

In this article, brief reference is made to points that must be considered in keeping fuel consumption to a minimum.

The Carburettor.

The fuel and air mixture must be thoroughly proportioned by the carburettor to ensure that a highly combustible mixture is burnt in the engine. A rich mixture wastes fuel, promotes carbon deposits and decreases engine power. A lean mixture overheats the engine, burns the engine valves and seats, and also causes loss of engine power.

Occasionally the position of the choke valve should be checked to ensure that it is in a fully open position when the engine is warmed up and operating smoothly. A partly closed choke valve results in heavy fuel consumption.

Economic and Trouble-free Operation of Farm Tractors and Other Machinery Depends on Careful Maintenance and Accurate Adjustment.

Dismantling of the carburettor by other than a competent person is not recommended. There is always a possibility that the fuel level in the carburettor float bowl could be lowered or raised, the cause being disalignment of the float, which, in some instances, may bind on the side of the bowl casting. This would result in variations in the mixture being supplied to the engine.

A poor fitting or damaged gasket between the carburettor flange and inlet manifold will often cause hard starting of the engine—by reason of the fact that air enters at a point above the venturi of the carburettor. Less fuel and more air would then enter the engine cylinders resulting in a weak mixture and loss of power.

The Air Filter.

The purpose of the air cleaner is to supply filtered air to the carburettor. If the free flow of air through the filter screen is restricted by excessive accumulations of dust or chaff, the fuel supply to the engine would be increased. Restriction of the air through the filter would have the same effect on the mixture as a partly closed carburettor choke valve.

Valve Tappet Clearance.

Maintenance of the proper clearance bebetween the valve tappets and valve stems is most important. The manufacturer's specifications must be followed.

Insufficient valve tappet clearance will result in early opening of the valves, and, in many instances will cause pitting and burning of the valve face and its seat. Excessive gap clearance will cause the valves to open late and again heavy fuel consumption is caused.

Loss of engine power is often traced to incorrectly adjusted valve tappets, and the consequent increase in fuel consumption that is required to maintain maximum power output is often due to this cause.

Ignition.

Adjustment of the magneto contact breakers and spark plug electrodes must be carried out at regular intervals of tractor operation. The clearance between the points should be as specified by the manufacturers of the tractor. The result of incorrectly adjusted contact breakers is reduced current value and a poor spark at the plug points. Reduced power output of the engine is caused by incomplete burning of the gas mixture and, consequently, more fuel is required per horse-power hour.

Spark plugs are obtainable in several heat ranges. The manufacturers of the tractor specify the correct type of plug to use, and their directions should be followed. Fuel consumption is increased by using the wrong type of spark plug.

Engine Operating Temperature.

The importance of maintaining the temperature of the cooling water at 180 to 200 deg. Fahr. must be emphasised. At this temperature the fuel vaporizes more readily and gives a much higher percentage of power per gallon of fuel used.

Lubricating Oil.

To use engine oil of good quality and change it at the hourly periods specified in the tractor instruction manual, is strongly advised. In addition to preventing metal to metal contact of the moving parts, the oil must assist in sealing compression leakage between the piston rings and cylinder walls. The oil should be the S.A.E. number specified by the tractor manufacturers. Heavy oils cause greater piston drag with consequent greater fuel consumption.

Tractor Hitches.

The correct line of hitch between the drawn implement or machine and the tractor drawbar will, in most instances, reduce the draft of the implement and also reduce tractor rear wheel slippage. A hitch that is slightly lower on the implement than on the tractor drawbar will give the best results.

A hitch that is high on the drawn implement and low on the tractor drawbar will tend to raise the rear wheels of the tractor off the ground and would also cause wheel slippage. The rear of the implement will have a tendency to rise out of the ground and the front will be pulled down. On the other hand, a low hitch on the implement and high on the tractor drawbar will give the reverse effect.

Resistance of Drawn Implements.

Mouldboards of ploughs not in use should be coated with heavy oil or some recognised rust preventive. These parts, when rust coated, add considerable draft to the implement. Tests have proved that up to 15 per cent. of additional power is required to draw a plough with rust-coated mouldboards, as compared with mouldboards that are smooth and bright.

Loading the Tractor.

The pulling of heavy implements for prolonged periods with tractors in low gear is not recommended. This particularly applies in the case of pneumatic-tyred tractors, as under unfavourable soil conditions a high percentage of wheel slip takes place. If the wheel slip amounted to as much as, say, 10

(*Continued on page 470.*)

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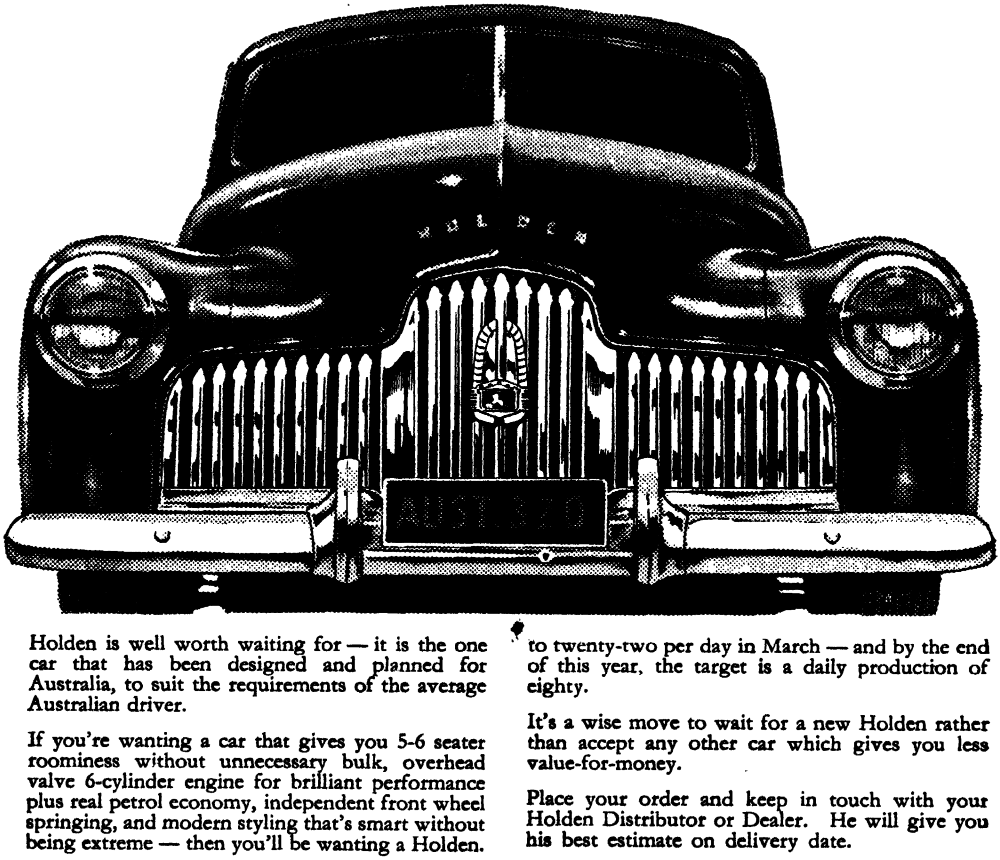

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PLANT DISEASES

BLUE AND GREEN MOULD ROTS
Of Citrus Fruits

T. B. KIELY, D.Sc.Agr., Plant Pathologist.

FROM time to time considerable loss is caused by the blue and green mould rots of citrus fruits. Coastal growers are principally affected; however, losses sometimes do occur in crops on inland irrigation areas.

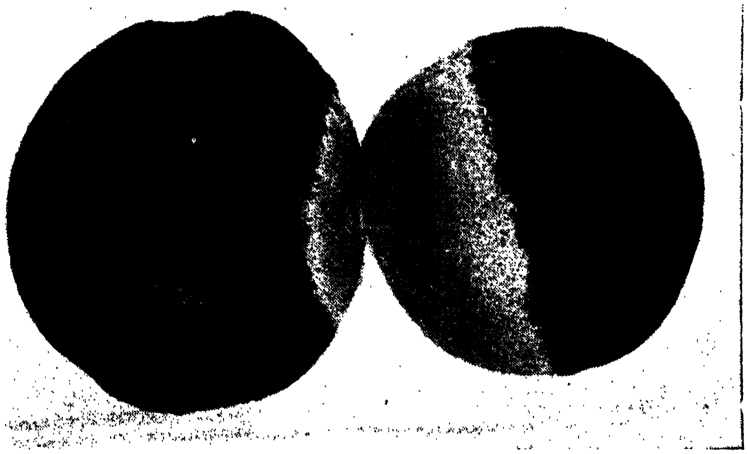
The blue and green mould rots are fungous diseases caused by the moulds *Penicillium italicum* and *P. digitatum* respectively. All species of *Citrus* are susceptible, the fruit being mainly affected at maturity. Occasionally infection occurs on fruit on the tree; the greatest loss, however, takes place after harvest.

Symptoms.

The first noticeable symptom of either blue or green mould rot is the development of a soft, water-soaked area on the surface of the mature fruit. This area is easily broken by a slight pressure of the finger. Under conditions favourable to the disease it enlarges rapidly and is quickly covered by a dense white mouldy growth at the centre of which masses of fungal spores commence to form, giving the rotted area its characteristic blue or green colour. The entire fruit is soon affected and becomes a soft rotting mass, covered entirely by the coloured spores which rise in clouds from the decaying fruit at slightest touch. Because of the large number of spores produced on a single rotting citrus fruit, it is understandable, in seasons when the condition is troublesome, that field cases, washing tanks and the equipment of the packing-house generally become contaminated with spores, and so constitute a danger to other sound fruit being handled.

Infection.

Sound, undamaged citrus fruits are not affected by these rots. It is only after the rind is injured, even by the slightest abrasion, that infection can occur. Injury to the surface of the fruit may take place in a number of ways, any one of which may, under favourable conditions, cause very serious loss.



Oranges Attacked by Blue Mould.

Many infections take place through fine punctures in the rind. Upon examination the majority of apparently sound fruit are found to be injured with minute scratches and abrasions on the rind surface. In the normal course of inspection, these escape detection; however, they provide a favourable method of entry for moulds. Injuries of this type are generally caused by faulty handling in picking, use of rough field boxes, jolting in transport and lack of care in handling at the packing shed.

The liberation of even small quantities of essential oil from the oil glands renders the rind more susceptible to mould attack, as the fungous spores are able to germinate in citrus oils on the surface of the fruit, and directly infect it. Oleocellosis (liberation of essential oil over and injury to the rind surface) may be caused by hail, excessive mineral oil spray applications and harvesting the fruit while still moist. High percentages of mould infection result where fruit is affected in this manner.

Severe wounding and actual penetration of the fruit is responsible for some mould infection, but losses due to this cause are not as common as might at first be thought. Penetration by orange worms and stinging by fruit flies will cause fruit to go mouldy while still hanging in the tree.

Development subsequent to packing is favoured by injuries to the fruit caused by the over-filling of field boxes, badly adjusted grading machinery, as well as splinter and nail injuries in the case after packing.

Contributing Factors to Mould Development.

Mouldy breakdown of citrus fruits after packing is influenced by storage temperatures, the degree of maturity of the fruit, and the failure to dry fruit thoroughly where it has been washed and graded in a packing house. Little mould development takes place at 40 deg. Fahr.; however, fruit kept at 65 to 75 deg. Fahr. is likely to develop a maximum of wastage due to mould development. Over-mature fruit of low vitality late in the season is extremely liable to mould rots and should be handled promptly and with great care, while failure to dry fruit thoroughly before packing will prejudice the effective life of even the highest keeping quality fruit.

Control.

Reduction of mould rots in citrus fruits can be obtained only when all contributing factors have been eliminated or greatly diminished.

Careful handling of fruit at all stages from the time it is picked until it reaches the consumer is the most important requirement for the prevention of mould rots. Pickers' finger nails should be trimmed to prevent undue scratching of the rind. Picking bags should not be over filled and fruit, which should be picked only when the surface is dry, should be emptied carefully from the picking bag into the field case. These boxes should be free of rough surfaces, splinters and nail head projections, and should not be over filled so that damage to the fruit is likely during transport.

In the packing house, injury to the fruit should be minimised by detailed attention to the grading equipment. All exposed surfaces must be smooth and free of irregularities liable to bruise the fruit. Sanitation in the packing house cannot be overstressed; mouldy fruit and culls should be removed daily, while damaged fruit lodged or jammed in rollers, brushes and washing tanks should also be removed at regular, short intervals. The liquid in washing tanks should be removed and renewed frequently to prevent accumulation of infective spores at this stage in the process.

Antiseptic treatment of fruit in disinfectant solutions such as 5 per cent. borax, prior to packing, is sometimes practised, and the operation generally has much to commend it. However, it is not a substitute for careful handling of the fruit, and should be considered only as an additional precaution against mould infection.

Above all else, it cannot be too strongly emphasised, that the greatest contributing factor to freedom from mould infection is careful handling of the fruit at all stages from the time it is removed from the tree until it is delivered to the consumer.

CROWN GALL OF PLANTS

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

CROWN GALL, as the name suggests, is a disease which is manifested by the development of galls, or outgrowths, near the crown of plants; however, it may also occur on the roots. The disease is more serious in its effects on stone fruits (peaches, almonds, etc.) and certain ornamentals (*e.g.* roses), than on pome fruits (apples, pears, etc.).

The galls, which vary from the size of a pea to a diameter of many inches, are produced by the plant, following attack by the pathogenic bacterium, *Agrobacterium tumefaciens*. A closely related organism *Agrobacterium rhizogenes* causes a hairy root condition on apple stocks.

Although crown gall is mainly introduced to the orchard on the stock at the time of planting, the bacteria are widely distributed through the soils of New South Wales, and quite frequently galls originate after the trees have been planted out.

The true crown gall disease should not be confused with other outgrowths which are occasionally observed on fruit trees. The "burr knots" which occur commonly on the branches of quince trees, and on certain varieties of apple and pear, are special tissue developments which are not of pathogenic origin.

The infectious crown gall diseases are initiated when the causal bacteria gain entry to the tissues of the plant, usually at points where the plant has been injured. In nurseries, cut roots and the ends of cuttings are freely infected. In the orchard infection can occur when plants are injured during planting and at points where roots have been injured by insects or by cultivation implements. The bacteria can be carried from infected plants to healthy ones by irrigation water.

It is not uncommon to find well-established, vigorous trees, with large galls on the roots and crown, showing no

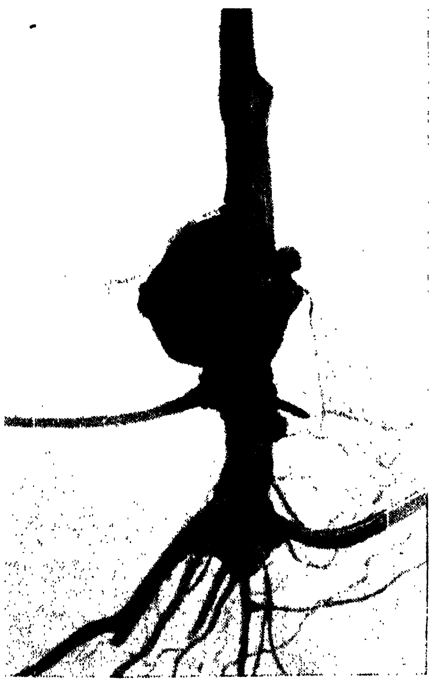


Fig. 1.—A Young Peach Tree with a Large Gall at the Crown.

Fig. 2.—A Young Peach Tree Extensively Galled.

Fig. 3.—Roots from a Young Pear Tree, with Extreme Development of Crown Gall Tissue.

apparent reduction of yield or general vigour. Given adequate nutriment and soil moisture, such trees will probably continue to crop satisfactorily, but under drought conditions trees affected by crown gall are usually the first to succumb.

In the orchard the greatest damage from this disease occurs in the case of newly-planted trees showing galls at the time of planting. If soil or seasonal conditions are unsatisfactory, there is usually a heavy rate of mortality during the first or second season after planting.

In the nursery crown gall is a perennial problem. The nurseryman is never certain of his yield of saleable trees, and frequently has to reject 10 to 20 per cent. of each planting, with losses ranging as high as 80 per cent. in some instances.

Control Measures.

In the Nursery.—Every possible precaution should be taken to reduce the intensity of the disease in the nursery.

1. Extreme care should be taken to minimise infection at grafting. Only healthy seedlings should be selected as stocks, all diseased plants being rejected and burned. If the disease is prevalent, additional precautions should be taken by disinfecting both stocks and scions, the grafting bench and knives.

All grafts should be carefully made in order to avoid excessive callusing.

Callus growths may be confused with crown galls, but usually have a smoother surface. Furthermore, careless grafting will increase the risk of crown gall infection.

2. Practise rotation in planting, endeavouring to grow less susceptible plants in land where heavy infection of the previous crop occurred.

3. In small areas, soil sterilisation by steam has proved effective. However, soil sterilisation on a large scale is quite impracticable.

In the Orchard.—

1. Growers should examine plants very carefully for the presence of crown gall, and should not plant any which are infected. Control cannot be obtained by chipping off the galls before planting.

Fig. 4.—Crown Gall Infection on Pear and Almond Roots.

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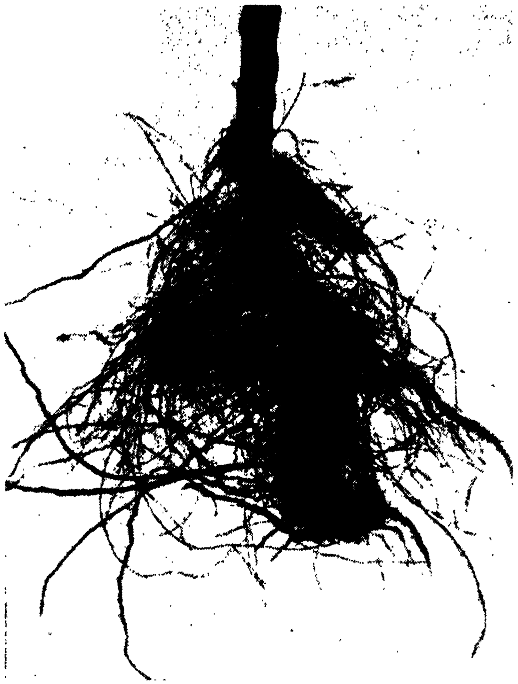


Fig. 5.—A Young Apple Tree Affected by "Hairy Root."
In the field it is often difficult to distinguish this disease from a similar condition which is characteristic of the normal root growth of certain strains of Northern Spy stocks.

2. When plants are removed on account of crown gall, replanting should only be made subsequent to soil treatment. Preliminary tests indicate that 2 to 3 lb. of sulphur, well worked into the soil some weeks prior to replanting, will minimise risk of infection whilst the tree is young and liable to be seriously affected.

3. Galls may be removed from the crown of established stone fruit trees by treatment with Dinoc and methylated spirit. Any other propriety fungicide containing sodium dinitro-o-cresylate would also be effective. The treatment may be applied to galls on stone fruit trees at any time of the year. Its use on grape vines is still under investigation.

In cases where the gall is likely to ringbark the tree the removal of the gall is of obvious advantage, but there is, at present, no experimental evidence establishing that the removal of smaller galls is of value to tree vitality.

Details of the treatment are as follows:—

(*a*) Prepare a mixture consisting of one part of Dinoc to four parts of methylated spirit. Some of the chemicals present in Dinoc settle firmly on the bottom of the container during storage; therefore, the Dinoc must be thoroughly stirred before it is mixed with the methylated spirit.

(*b*) Remove the soil from the base of the tree to expose the gall.

(*c*) Chip off the gall as thoroughly as possible, collecting the pieces so that they may be destroyed by burning.

(*d*) Paint over the galled area with the above mixture, painting to about ½ inch on to the healthy bark.

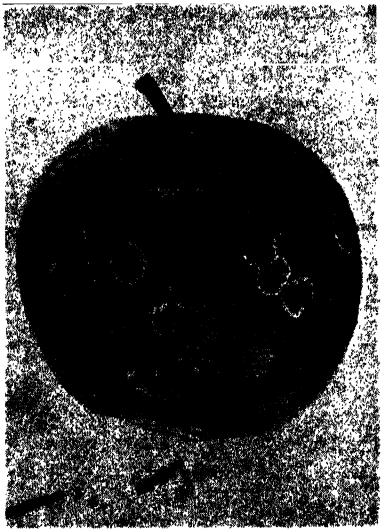
(*e*) Leave exposed for one month and repaint with the Dinoc-methylated spirit mixture. The soil may then be replaced.

If any regrowth of the gall occurs subsequently, the treatment should be repeated.

Fig. 6.—Heaps of Nursery Peach Trees Rejected at the Time of Digging, because of Crown Gall Infection.
A common sight in large nurseries.

BLACK SPOT OF APPLES AND PEARS

BLACK spot, the most serious disease of apples and pears in New South Wales, is costly to control, but if control measures are neglected or imperfectly applied the yield and quality of fruit may be greatly reduced. This reduction is brought about by the killing of blossoms, the shedding of young fruit, the scabbing, cracking and distortion of growing fruits and an adverse effect on tree vitality caused by severe leaf infection and subsequent partial leaf defoliation. Losses may occur as the result of the development of black spot on the fruit during storage.



Granny Smith Apple Affected with Black Spot.

The spores of the fungus which causes the disease may over-winter in bud scales on the tree or the fungus itself may remain alive in infected twigs. In both cases reinfection takes place when the tree begins to grow in the spring. However, by far the greatest source of renewed attack arises from the dead leaves beneath the tree. The fungus continues to develop in this debris during the winter and, in the spring, liberates myriads of air-borne spores which settle on leaves, blossoms, etc., and, if climatic conditions are favourable, result in a serious outbreak of the disease.

At the present time spraying the trees at frequent intervals is the most satisfactory method of control. The following programme is recommended for apples:—

1. Spray at "greentip" with Bordeaux mixture, 15-15-100-½, or with lime sulphur, 1-20.

2. Spray again at "spur-burst" with Bordeaux mixture, 15-15-100-½.

3. Spray at "pinking" with lime sulphur, 1-40.

4. At "calyx" apply lime sulphur, 1-80 to 1-100.

5. Spray with lime sulphur, 1-80 to 1-120, at intervals of three weeks if the weather is persistently wet or humid. This is not necessary if hot dry conditions prevail.

If the variety of apple being grown does not tolerate lime sulphur, substitute colloidal or wettable sulphur.

Making Efficient Use of Fuel in Farm Tractor Operation—*continued from page 464.*

per cent., it follows that approximately 10 per cent. more fuel would be consumed in doing the work.

A certain amount of fuel is consumed in overcoming the rolling resistance of a tractor, and as this applies irrespective of the load drawn, it is obvious that light loading is not economical. The loading of a tractor should, where possible, be that approximating its rated drawbar horse-power.

Maintaining the Engine Compression.

To obtain the maximum power output from and economic operation of any internal combustion engine, the most important requirement is the maintenance of the cylinder compression pressure. Leaky valves, worn piston rings and cylinders cause a high percentage of power losses. A reasonable compression pressure must be maintained, otherwise all other adjustments would not greatly reduce the cost of operation.

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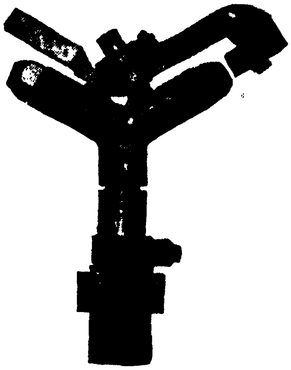

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BROWN ROT. Spray with Neptune Lime Sulphur. More than one spray may be necessary.
BLACK CHERRY APHID, GREEN AND BLACK PEACH APHID. Spray with Neptune Black Leaf 40 plus Neptune White Spraying Oil.
FRECKLE. Spray with Neptune Lime Sulphur.

CITRUS
RED SCALE. Prepare for early summer spraying, by ordering now your supplies of Neptune White Spraying Oil.
APHID. Spray with Neptune Black Leaf 40 combined with Neptune Lime Sulphur plus Neptune Casein Spreader.
BRONZY CITRUS BUG. Spray with Neptune D.D.T. Dispersible Powder.

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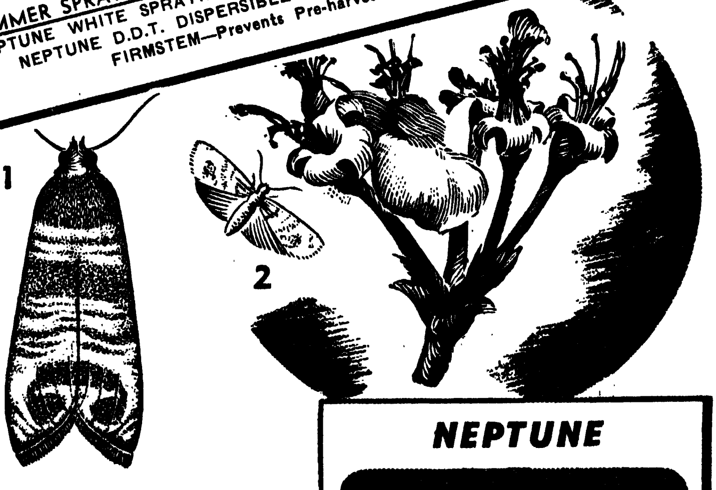

Codling Moth

1. Codling Moth greatly magnified.
2. Codling Moth actual size, and opened calyx of fruit. A common avenue of entry of the grub.

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FRUITGROWING

CONTOUR FURROW IRRIGATION OF ORCHARDS

On the Murrumbidgee Irrigation Area

TO AVOID UNEVEN WATERING

A. H. SKEPPER, H.D.A., Fruit Officer.

TO ensure the success of their fruitgrowing operations many orchardists in this State have to rely on irrigation to supplement the natural rainfall. Of the various systems of irrigation in use, probably the cheapest in outlay and application, is the furrow system, in which water is run down a number of furrows between each row of trees. Where conditions of soil type and land topography permit its use, orchardists on the Murrumbidgee Irrigation Area have adopted this system to the almost total exclusion of all others.

This necessary irrigation water may, if not correctly used, be the means of causing the death or unthriftiness of the trees and possibly, even permanent damage to the land. The problems of uneven watering may largely be solved by correct irrigation design, including provision for contour furrow irrigation.

Efficient irrigation means that the whole planting gets sufficient water for its needs, when required and without undue waste of water. Excessive water penetrating the soil is lost to the trees, and if the underground drainage is slow, then there is danger of rising water tables, resulting possibly in the land becoming salted.

In order to effect efficient irrigation and to guard against excessive penetration, the

Fig. 1.—Young Orange Trees Planted on the Contour, to give Uniform Irrigation Slope.

irrigator must have adequate control of the water. To get this control with furrow irrigation certain precautions must be taken and correct irrigation design and management are essential. Factors to be considered in designing and managing are:

1. Type of soil.
2. Topography of the land.
3. The irrigation slope.
4. Length of furrow run.
5. Preparation of the land for irrigation.
6. Rate at which water is applied.
7. The time water is allowed to flow in the furrows.

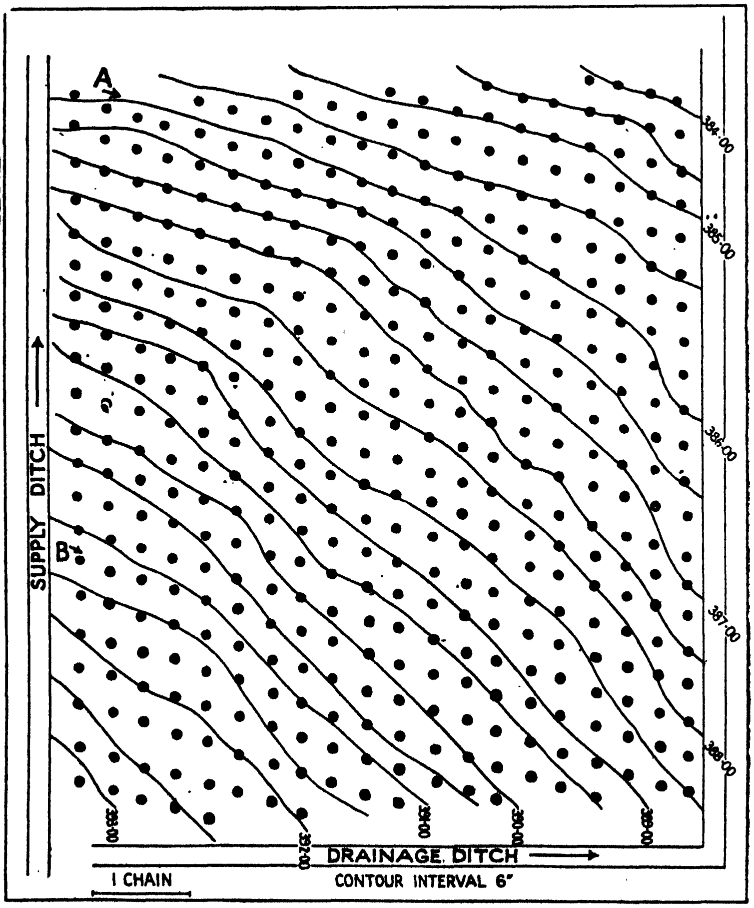


Fig. 2.—Actual Block of Trees Planted to Straight Row Design.
Note variation of fall between row "A," viz., 0.9 inch per chain and row "B," 5.14 inches per chain. Variation of fall in row "A" is 0 to 3 inches per chain, and in "B," 2 to 8 inches per chain.

Why is Contouring Necessary?

Efficient irrigation results when these factors are considered in relation to each other. The irrigator has little or no control over the soil type, and he has but little control over the topography of the land, although in some cases minor modifications can be made by grading. However he can exercise control over all the other factors, not the least important of which is the irrigation slope.

Within the limits fixed by the topography of the land, the irrigation slope is primarily set by the design to which the orchard is

planted. In the past it has been the practice to confine plantings to straight rows, and where the natural slope of the land gave approximately the desired slope, the rows were planted up and down the slope, directly across the contours. Where the land had a natural fall too great for efficient irrigation the rows were placed at an angle across the slope.

This method was satisfactory only when the slope of the land was uniform. Unfortunately its use has often resulted in irregular irrigation slopes, variations occuring both between one row and another and also within the one row. Fig. 2 is an actual example of such a block. Note the variation of slope along Row A, and the variation between Rows A and B. The maximum variation in this block is from 0 inches to the chain to 12 inches to the chain. Under these conditions uniform irrigation is impossible, some trees receiving excess water and some not enough.

Growers faced with similar problems often attempted to correct the trouble by grading. This was not only expensive but also frequently meant the removal of so much surface soil from some areas that insufficient soil was left to grow a satisfactory tree. Excessive grading is also damaging to the soil structure. Frequently the irregularities of slopes were of such a nature as to be beyond the scope of the farm grader to correct, and consequently nothing was

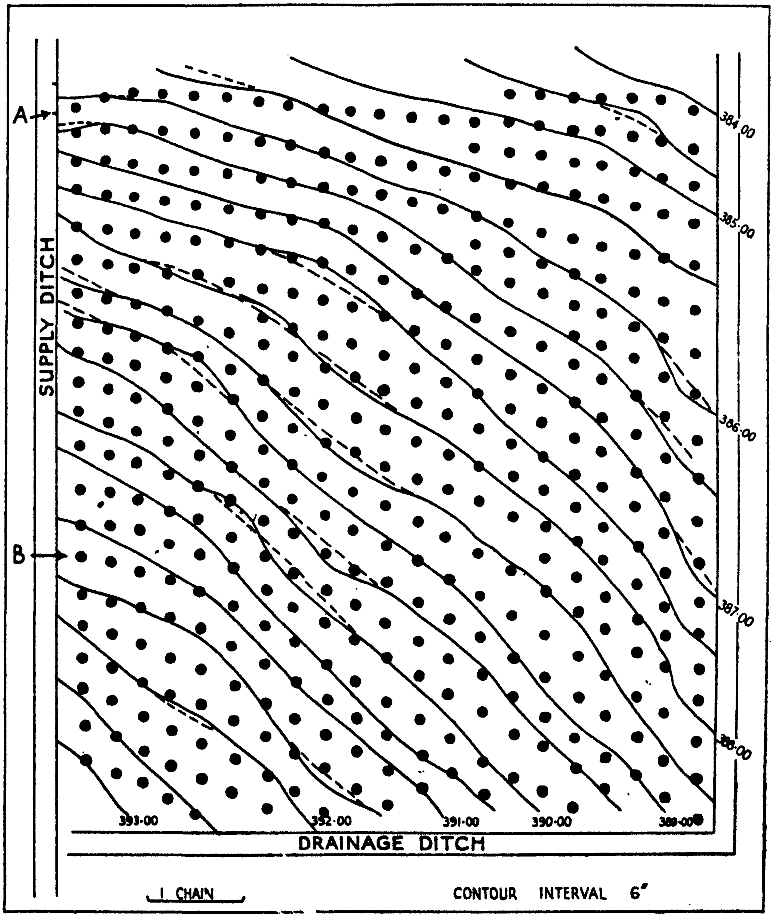


Fig. 3.—Same Area as in Fig. 2, Set Out as a Contour Block.
Note the uniformity of grades within the rows and between one section and another. Fall in row "A," 3½ inches per chain, and in row "B," 3 inches per chain.
Dotted lines indicate where minor grading is necessary.

Fig. 4.—Footland Erosion—the Result of Failure to Provide a Stabilised Drain.

done. Another problem sometimes induced by these irregular slopes was the erosion of furrows and the silting up of footlands.

These troubles caused by unsuitable slopes may largely be overcome by correct irrigation design, including the selection of the correct irrigation slope for the particular block to be planted. This design may involve departure from the practice of rigidly adhering to straight row plantings, and the adoption of contour furrow irrigation.

What is Contour Furrow Irrigation?

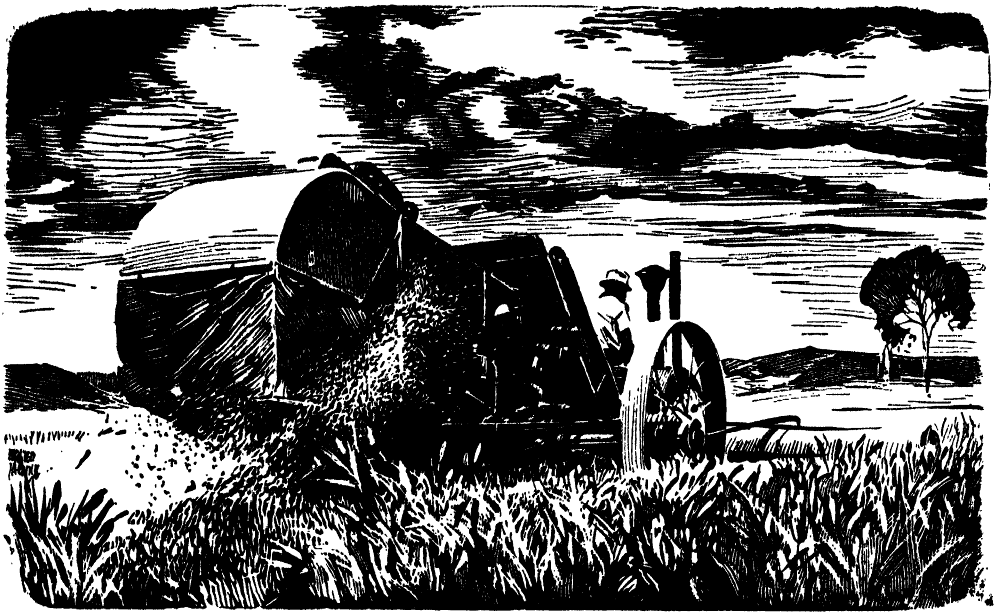
Contour planting is a system of laying out a block in such a manner that the rows of trees follow a set and constant grade throughout their length. The system has found widespread favour in areas of high natural rainfall, where soil erosion caused by water run-off is a problem. The same system of lay-out, with minor modifications, has been used for setting out blocks for furrow irrigation on land where the natural slopes are such as to bring about difficulties arising from irregular irrigation slopes.

With contour planting the tree rows depart from the straight line whenever necessary to maintain the correct grade. Fig. 3 is the same area of land as in Fig. 1 but in this instance it has been set out for contour furrow irrigation. Although there has been no grading to correct minor hills and hollows, note the much greater uniformity of the irrigation slope. In order to avoid unnecessary curves in the rows, all the minor high and low spots which can be easily graded out, are corrected by grading, if possible prior to the setting out of the contour design.

On hillslopes where soil erosion is likely to occur, grassed waterways to dispose of drainage water should be established, preferably some time prior to the planting of the block, so that the grass cover can become established and the soil stabilised before the drain has to carry water.

Grade, Soil Type and Length of Run.

Prior to the pegging out of the block it is necessary to decide on the most suitable grade for the planting. No fixed grade will suit all circumstances, and there are limits above and below which it is not desirable to go. The soil type, the degree of cross slope and the length of the run all affect the situation. Heavy soils with slow penetration rates permit the use of flatter grades, and likewise lighter soils with their fast penetration rates, water more satisfactorily with somewhat steeper slopes.



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With any given grade the heavier the soil the longer the run that may be uniformly irrigated, and the steeper the cross slope the steeper should be the slope used, so as to give more safety against breakaways from furrows.

Generally the most efficient slope lies between 2 to 4 inches per chain; slopes in excess of 4 inches per chain frequently result in furrow erosion. Length of run of from 4 to 6 chains has proved most satisfactory. Farmers contemplating planting new areas for furrow irrigation should consult their local Extension Officer for advice on the lay-out to be adopted. It is usually impossible to make adjustments and alterations after planting.

(To be continued.)

SCALY BUTT OF TRIFOLIATA

Need for Certified Buds for all Citrus on this Stock

CONTRIBUTED BY THE TRIFOLIATA IMPROVEMENT COMMITTEE.*

IT has been shown recently† that scaly butt, the disease which has prevented the general use of Washington Navel oranges on Trifoliata stock, is caused by a virus carried in the scion wood and affecting only Trifoliata. With the announcement of this discovery a recommendation was made as to how scaly butt is to be avoided, namely, by careful bud selection. The buds should be selected from Washington Navel trees on Trifoliata stock, which are free of scaly butt and of good performance. Such trees should be at least eight years of age.

Scaly butt in Trifoliata worked with Valencia orange has, up till recently, been considered to be sufficiently rare to be disregarded. However, in March of this year, a block of young Valencia trees worked by the grower using buds taken from his own trees on rough lemon stock and showing more than 10 per cent. with scaly butt, was brought to notice.

Since Valencias on Trifoliata have been very extensively planted in the Murrumbidgee Irrigation Area during the past six years, a survey of trees old enough to show the disease was made immediately. Only three other blocks were found where scaly butt was present. In one block the number affected was 3 out of 220, in the second block 9 out of 23—one seriously, the rest slightly—but in the third block the number of scaly butt trees approached 50 per cent.

The explanation of these records is that infected bud wood must have been used for the production of those trees now showing scaling, indicating, therefore, that an occasional Valencia on rough lemon must carry the virus, though the number of such trees is small. The virus in Valencia, as in Washington Navel, produces no symptoms with rough lemon as the rootstock.

The conclusion to be drawn from the results of the survey is that the large-scale nurserymen who, each year, use many thousands of buds from many sources, run little risk of obtaining a dangerous percentage of infected buds, but the small-scale nurseryman who selects his own buds from a limited number of trees, may be unfortunate enough to get a high percentage of infected buds if one of the scion trees happens to be carrying the virus.

In view of this possibility, it is recommended that all buds for use on Trifoliata stock should be taken from trees of known performance on that stock, whether they be Valencia, Washington Navel, grapefruit or mandarin. Lemons are still not recommended for use on Trifoliata.

A more expanded account of scaly butt investigations to date will shortly be published.

* The Committee consists of Mr. R. J. Benton, Principal Fruit Officer (Extension) (until recently Special Fruit Officer —Citrus), Drs. F. T. Bowman, Special Fruit Research Officer (Convener), and Lilian Fraser, Plant Pathologist, and Mr. R. G. Kebby, Special Fruit Officer (Citrus). The authors wish gratefully to acknowledge to assistance of Mr. H. J. Braund, who first drew attention to an unduly high percentage of scaly butt in Valencia, as well as continued co-operation of other growers.

† *Agric. Gazette*, Jan. 1, 1949, 31–34.

THINNING THE ON-YEAR APPLE CROP

The Problem and Methods

F. T. BOWMAN, Ph.D., Special Fruit Research Officer.

ALTERNATE cropping of apple and pear trees is the condition of a heavy crop one year, followed by no crop or a light crop the following year. Large limbs on a tree may act as units, but usually the whole tree behaves as the unit, and when entire blocks of trees are involved in this rhythmic behaviour the economy of the orchard is seriously affected. Further, entire districts and combinations of districts swing together into alternate heavy and light crop years, and it then becomes an economic problem of the industry at large. This swing is reflected conspicuously at times in Commonwealth production figures, such as during the 1920's and 1940's in Fig. 1.

This problem resolves itself into two aspects:—

1. **The thinning of the on-year crop. This will improve blossom bud formation for the succeeding blossoming.**
2. **The improvement of the setting in the light-year crop. This will reduce the excessive blossom bud formation that occurs in the light year, so giving a more normal blossoming in the succeeding year.**

The former aspect of this problem is amplified in this article.

The Overlapping Processes of Cropping and Fruit Bud Formation.

In apples and pears the fruit production of one year and the blossom bud production for the next year are over-lapping processes, as shown diagrammatically in Fig. 2.

With bud break two classes of primary buds may be recognised—leaf buds and mixed buds. The primary leaf buds develop into short shoots (spurs) or longer shoots (laterals). The mixed buds, in the month between bud break and blossoming, develop into a cluster base bearing small leaves and, terminally, a bunch of five flowers. The blossoms go through two main drops which are first discernible at twenty-one and thirty-five days after full bloom. By these two natural sheddings the size of the final crop is practically established.

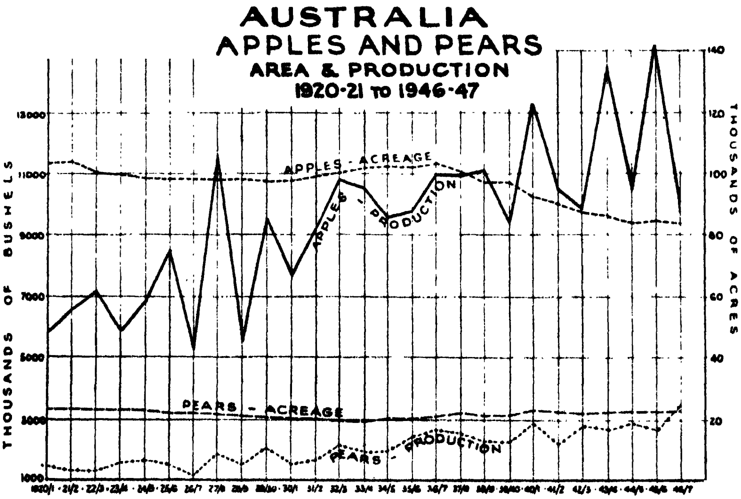

Fig. 1.—Graph showing Australian Area and Production of Apples and Pears, 1920–21 to 1946–47.
[*From Quarterly Review of Agricultural Economics.*

On the cluster base before blossoming, buds develop from the axils of one or two of the leaves. These usually make short growths called secondary leaf spurs. If blossom bud formation is to occur it will take place terminally in these secondary leaf spurs and the primary leaf spurs, during mid-summer, when the fruit is about half-grown. As is well known the terminal bud of laterals also may form blossom buds. The process of blossom bud differentiation has been fully described for Australian conditions[1].

Although the time of blossom bud formation has been known since the turn of the century[4] the precise causes of blossom bud formation remain unknown, and we are obliged to employ predisposing factors to influence it. The outstanding predisposing factor, at least in the on-year, is not so much the amount of crop being carried at blossom bud formation time in mid-summer, as the amount of blossom and the amount of setting that took place within about five weeks of full blossom. Being some two months in advance of the first microscopic appearance of blossom buds, this period has been called a blossom bud induction period[6] or the effective period[3]. It coincides with the pre-drop period of thirty-five days and with the spur leaf expansion period.

To recognise the type of blossom is, therefore, of great practical importance, particularly in the on-year.

Excessive Blossoming.

All deciduous trees produce a surplus of blossom compared with the actual number necessary to produce a crop. Within limits, this surplus blossom apparently does no particular damage to the tree, but on-year trees exceed these limits. What may be called excessive blossom, is the amount which predisposes the tree to blossom and fruit lightly in the next year. The amount which may be designated excessive, varies according to the variety and the cropping history of the tree.

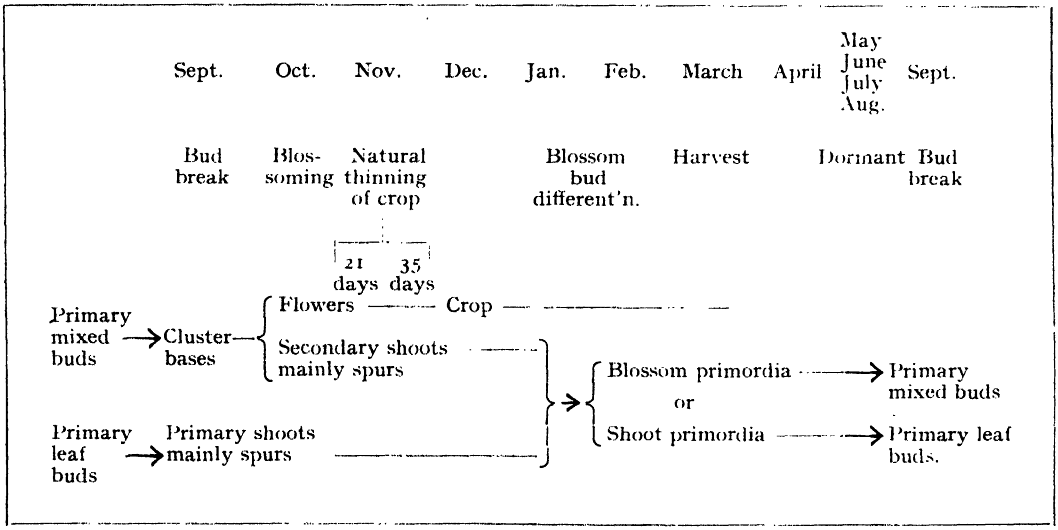

Fig. 2.—Diagram showing the Overlapping Processes of Fruiting and Blossom Bud Formation.

In Fig. 3, the results of many years of observations are summarised diagrammatically, by showing that trees of Delicious and McIntosh may blossom up to approximately 70 per cent. and Jonathan and Rome Beauty up to approximately 80 per cent. and still remain regular croppers. Blossoming in excess of these amounts is a good indication that an on-year crop will result. If the excess is not large, say, up to another 10 per cent. a light crop will probably follow next season, but greater excesses will predispose to a completely off-year that season.

The term percentage blossom denotes the percentage of all shoots that carry blossom.

Methods of Thinning.

From a practical point of view, it is important to recognise excessive blossoming and setting, as this is the tangible point of attack on the somewhat involved problem. If it is allowed to pass unchecked, two years must usually intervene before such action can next be taken.

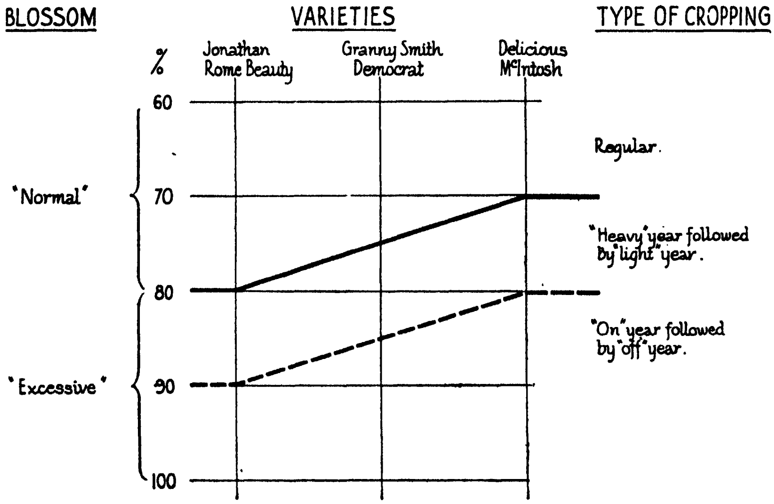

Fig. 3.—Diagram showing Type of Crop indicated by Percentage Blossom in Some Apple Varieties.

An early and heavy thinning of the blossom or fruit, called pre-drop thinning to distinguish it from ordinary fruit thinning, is necessary to bring about any appreciable effect on blossom bud formation. It has been found that, of the 3 to 4 months period which elapses between blossoming and blossom bud formation, the most effective period at which to carry out the thinning operation, is at or shortly after blossoming, and that there is little likelihood of promoting blossom bud formation by thinning after five or six weeks from full bloom. Even complete defruiting after this period did not result in blossom formation in several instances where on-year trees were de-fruited.

As explained in a previous publication,[8] hand thinning is scarcely a practical measure on a large scale, and sprays have been investigated to do this work. The sprays available are as follows:

1. *Caustic Sprays* (e.g., cresylic acid).—These sprays destroy blossom, but tend to russet the fruit to a greater or lesser extent and must be carefully timed to full bloom application.

2. *Wax-oil Emulsions* (e.g., Brytene, Brogdex).—Some of these compounds were good thinners, but are too expensive and make coverage of trees subsequently with fungicides or insecticides very difficult.

3. *Hormone-type Sprays* (e.g., 2-4D, Methoxone).—In certain respects these have been shown to be practical fruit thinning sprays. They are capable of thinning blossom or young fruit, without russetting or other injury to the remaining fruit. They do not have to be timed to full bloom stage and may be applied effectively at least until the calyx spray stage, which enables the grower to assess the thinning required after blossoming is over. They can be mixed with arsenate of lead or DDT codlin moth sprays. The spray material is cheap, costing less than a half-penny per tree.

The thinning effected resulted in the following effects on blossoming in the next year.

(*a*) Improved blossoming of some varieties, *e.g.*, Granny Smith and Democrat, so that instead of a light blossom these varieties blossomed normally. The indications are, therefore, that this thinning spray can be used to bring about a good measure of crop regulation in this group of varieties. It has been used very successfully to thin the tops of trees.

(*b*) Did not improve blossoming of some other varieties, *e.g.*, Jonathan and Delicious, in which in some instances blossoming was

(*Continued on page* 484.)

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INSECT PESTS.

Notes contributed by the Entomological branch.

PESTS OF POME FRUIT TREES

E. J. WASON, B.Sc.Agr., H.D.A., Entomologist, and N. C. LLOYD, B.Sc.Agr., Entomologist.

THIS article sets out the recommendations of the Entomological Branch for the control of pests of apple and pear trees, based on the results of investigations carried out during the past few years.

Codling Moth.

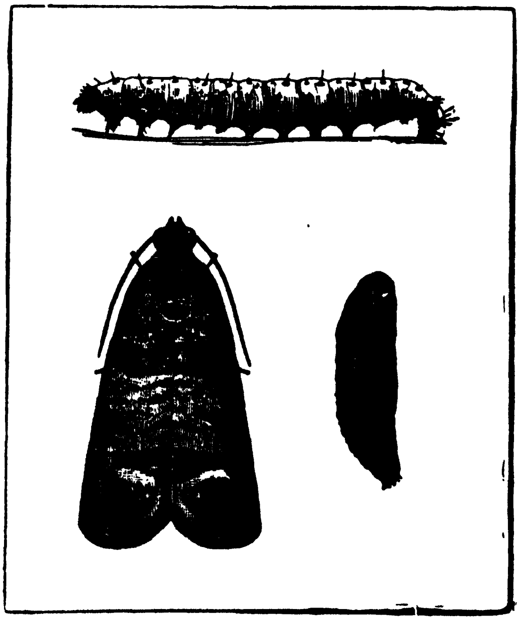
While it has invariably been found that DDT is superior to lead arsenate for the control of codling moth, the use of DDT results in great increases in the infestation of red mite, red spider and woolly aphid. For this reason, growers who have, over a period of years, obtained satisfactory commercial control (not more than 5 per cent. fruit loss) of this pest with lead arsenate, are advised to continue to use this material, there being no necessity to use DDT.

In orchards, or in districts where codling moth has proved difficult to control with lead arsenate, or in orchards where there is a large population of over-wintering larvae, the use of a limited number of DDT sprays is recommended.

Lead arsenate is used at the rate of 3 lb. to 100 gallons. The programme consists of a calyx spray when about 75 per cent. of the petals have fallen and before the calyx cups close, and a number of cover sprays, at intervals of not more than three weeks, up to the time the fruit is harvested or moth activity ceases for the season. It is recommended that the interval between the calyx and first cover sprays be not more than fourteen days because of the rapid growth in fruit size and production of new foliage which takes place at this time. Under hot, dry conditions favourable for moth development, an interval of approximately fourteen days between cover sprays is desirable.

The addition of white oil, 1 gallon to 100 gallons, in the second, third and fourth cover sprays improves control, but this addition of white oil is not possible where lime-sulphur is being used for the control of black spot.

If conditions during November or December are particularly hot and dry, it may be desirable to use DDT in place of lead arsenate in one of the cover sprays.



Larva, Pupa and Adult of Codling Moth.

In cherry-growing districts, the use of DDT in place of lead arsenate in a cover spray in late November, or early December, will ensure the apple trees being protected for a full three weeks' period, thus giving less interruption to cherry-picking operations in November and December.

The Use of DDT.—The concentration of DDT recommended is 0.1 per cent. Where it is to be used, the first application should be made seven to ten days after petal fall, the second ten to fourteen days later, and two further applications at three-weekly intervals.

These four DDT sprays, if properly applied, will give excellent control of the spring brood of moths (which emerges from mid-October to late December) and no further spraying should be necessary.

Growers are warned that it is just as necessary to secure a thorough coverage of the trees with DDT as it is with lead arsenate. The importance of picking-off and destroying any infested fruit at weekly intervals from late November cannot be too strongly emphasised. Growers should carefully examine the trees at the end of December and if, because of neglect of earlier sprays, or any other factors, a certain amount of infestation is then present, it may be necessary to apply follow-up sprays of lead arsenate in January and February.

DDT should not be used on the varieties Delicious and Lalla unless absolutely necessary, as these varieties are particularly susceptible to damage by red spider and red mite.

Control in Pears.—It has been the general experience throughout the State that codling moth is not as difficult to control in pears as in apples, and therefore the abovementioned lead arsenate programme, when thoroughly applied, can be expected to give very satisfactory control. Where lead arsenate is used, either in combination with white oil or lime-sulphur, little damage from red mite or red spider can be expected.

Red Mite.

Good control of this pest can be obtained by applying red oil or pale oil, 1 in 20, during the dormant period so as to destroy the over-wintering eggs. If these dormant sprays have been applied, summer spraying will probably not be necessary if lead arsenate is being used for codling moth control.

If, however, DDT is being used for this purpose, growers can expect a great increase in the population of mites, and it will be necessary to apply special mite sprays as well. These sprays should be applied before the mite population can increase to pest numbers and are best applied with the third and fourth DDT cover sprays.

For the hotter districts, such as the Murrumbidgee Irrigation Area, the recommendation is HETP ½ pint to 100 gallons plus a neutral wetter 2-3 oz. to 100 gallons added to the third and fourth DDT cover sprays.

In the more temperate districts, where sulphur sprays can safely be applied during the summer, two applications of dispersible sulphur 3 lb. to 100 gallons in the third and fourth DDT cover sprays are recommended.

It should be pointed out, however, that where a number of lime-sulphur sprays have been applied for black spot control, such sprays will be sufficient to control red mite, even where DDT is being used for codling moth.

Red Spider.

This pest can be particularly troublesome where hot, dry summer conditions are met with, and especially when DDT is being used for codling moth control. Dormant sprays are not effective against this pest as it mostly over-winters away from the trees.

The summer sprays recommended for red mite can be expected also to give satisfactory control of this pest, and, if DDT is to be used for codling moth, it is essential to use these sprays in the third and fourth DDT covers.

If red spider is found to be on the trees in large numbers in late summer, control can best be obtained with two applications of HETP at ten- to twelve-day intervals.

This pest breeds up in great numbers in spring and early summer on weeds and cover crops such as field peas, vetches and burr-medic. Where practicable, therefore, clean cultivation should be practised early

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in the spring, especially round the butts of the trees, to assist in reducing the population.

It may be mentioned that E605, or parathion, a new organic insecticide, has been found extremely efficient against both red mite and red spider, but further work is necessary before its use by growers can be recommended.

Woolly Aphid.

The use of DDT for codling moth control has been found to retard the development of the woolly aphid parasite, *Aphelinus mali*, so that it does not commence useful activity until much later in the season, with the result that aphid infestation is heavy for a greater period.

Everything possible should be done by orchardists to preserve this parasite in their orchards and to promote its activity. In districts with cold, wet winters it is recommended that growers collect a large number of twigs bearing parasitised aphids in late autumn. These should be placed in drums or boxes, given plenty of ventilation, and stored in an open shed. The twigs should be placed in the forks of aphid-infested trees about mid-September before the parasites emerge.

Where DDT is being used against codling moth, a few trees here and there through the orchard (which are aphid-infested and preferably carrying little or no crop) should be left unsprayed with DDT, and the fruit either pulled off or sprayed with lead arsenate. These trees will serve as reservoirs of parasites from which they can spread when DDT sprays are discontinued in the orchard in late December.

With this aphid, as with mites, sprays should be applied with the object of controlling the pest before it can breed up to large numbers—by which time much damage has already been done. Any trees which it is considered are likely to become heavily infested, should be sprayed in November with HETP ½ pint to 100 gallons, plus a neutral wetter 3 oz. to 100 gallons, and a second application given within ten to twelve days. These sprays could be combined with the second and third DDT cover sprays.

The HETP must be applied at high pressure as a coarse drenching spray so as to force it into the aphid colonies and thoroughly wet them. The manufacturers of HETP state that it should not be mixed with lead arsenate and on no account can it be mixed with lime-sulphur.

New insecticides, such as BHC and E605 (or parathion), are being tested. To date BHC has proved to be the most promising. Further work is necessary before any recommendation can be given.

Light Brown Apple Moth.

This pest has hitherto been of only minor importance in New South Wales, but last year, infestation was found, particularly on Williams pears, in a few orchards where DDT had been used. Damage by this pest has been correlated with the use of DDT early in the season with no sprays being applied during the January-February period.

Growers are advised to use only lead arsenate for codling moth control in pears, and then no trouble with light brown apple moth should arise.

A close watch for the possible spread of this pest will be kept in the coming season, and growers are urged to report any infestation without delay to the Chief Entomologist, Department of Agriculture, Sydney.

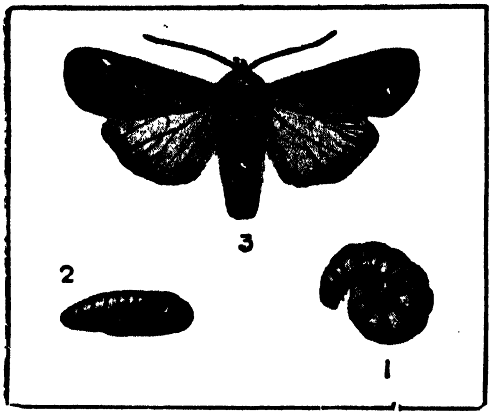
Cutworms *(Noctuidae)*

VEGETABLES and field crops grown in areas that were flooded in June, may become infested with cutworms in the spring.

Cutworms feed upon a wide variety of vegetation and may cause extensive damage to young plants soon after they appear above ground, or to newly-planted-out crops, such as cabbages, cauliflowers, tomatoes, etc., by eating through the stems at ground level. Most species feed at night and shelter during the day, either in the soil or under clods.

Cutworms vary in size, but mostly measure about 1½ inches in length when fully-fed. They are soft-bodied, and vary from almost black or slaty-brown to various shades of green or yellow, and often bear longitudinal stripes or other markings on their bodies. Many have the habit of curling up into a spiral when disturbed.

When fully-fed cutworms usually make their way down several inches into the soil and there enter their pupal or chrysalis stage within earthern cells.



1.—Cutworm or Larva. 2.—Pupa. 3.—Moth.

The adult moths which emerge from the pupae are mostly greyish-brown, reddish-brown, black or buff-coloured and measure about 1½ inches across their outspread wings. They frequently fly about lights at night. Under warm conditions the life-cycle from egg to adult may be completed in about six weeks.

Control.

The following poison bran bait is very effective in controlling cutworms: —

Paris green	1 lb. *or*
Benzene hexachloride (20 per cent.)	½ lb.
Bran	24 lb.
Water	2½ gals.

This amount is sufficient to bait one acre.

To prepare the bait, the bran and Paris green or benzene hexachloride, should be thoroughly mixed first, and then made into a crumbly mash with the water.

As a precautionary measure, any ground that has been covered with weeds and grasses, and has been cleared (or areas where cutworms are known to be already numerous in the soil) should be baited before the crop is planted. The bait is best broadcast late in the afternoon. Where crops are infested the mash may be distributed lightly along the rows.

Dusting or spraying crops with DDT will also control cutworms, and may be preferred by some growers to the baiting method. About 1 lb. of DDT should be applied per acre, and for dusting, 20 lb. of 5 per cent. DDT powder would be necessary to treat the area. Five per cent. powder may burn young tomato plants.

For spraying, about 100 gallons of spray containing 2 lb. of 50 per cent. dispersible DDT powder, or ½ gallon of 20 per cent. DDT emulsion would be required.

The Vegetable Weevil (*Listroderes obliquus*)

VEGETABLE weevils are likely to become numerous and to cause damage during the spring, particularly to potatoes and tomatoes.

These weevils, in addition to attacking vegetables, also feed upon a wide variety of weeds. Large pieces may be eaten from the leaves, and the new leaf-growth on the crowns of the plants may be eaten away as it develops; even the stalks may be consumed. Root crops such as carrots, turnips, parsnips, etc., may be devoured below ground and destroyed.

In their adult stage the weevils only feed at night and shelter during the day in the ground or under rubbish about the base of the plants. The larvae, although they feed mainly at night, may at times feed during the day.

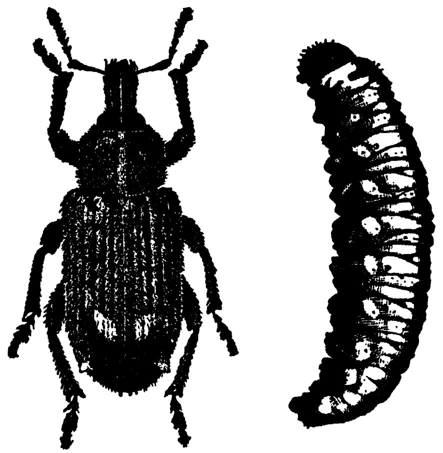
The adult weevil, which measures about ½ inch in length, is greyish-brown, and has its head produced into a snout. The adults are most numerous during October and November.

The larvae are legless grubs, which, when fully-fed, measure up to ½ inch in length. They vary in colour from light green to yellow. When fully-fed, the larvae enter the soil and construct small earthen cells, within which they enter their pupal or chrysalis stage. The adult weevils which develop from these usually commence to emerge from the soil in the spring, from about August onwards. They continue to feed until about the end of November and then return to the soil where they remain inactive during the summer. The eggs are laid on or near the plants during the autumn and winter months.

Control.

Infested crops may be dusted or sprayed with DDT as recommended above for cutworms. For tomatoes, however, a 2 per cent. DDT dust is suggested, as at the higher concentration burning of the young plants may occur. Where adult weevils are migrating from weed-covered ground, into tomato seed-beds, treatment of the seedlings with DDT may not be sufficient to prevent damage, as the weevils may destroy many of the plants before being killed.

As a precautionary measure, the treatment of a wide swathe of ground around the seed-beds with a pollard bait is recommended.



Adult and Larva of the Vegetable Weevil.

This bait may be made by mixing either:—

Paris green	1 lb., *or*
Benzene hexachloride (20 per cent.)	½ lb., *or*
DDT powder (5 per cent.)	1 lb., with
Pollard	24 lb.

The pollard bait should be applied dry and not as a wet mash.

Record Low Incidence of Bunchy Top.

THE record low incidence of bunchy top in north coast banana plantations last year has been maintained again over the past twelve months throughout the banana-growing districts.

The coverage made by the detector gangs for the year ended 30th June, 1949, was 120,631 acres, in which 5,565 cases of bunchy top were found and treated.

These figures compare very favourably with 112,682 acres inspected and 5,942 cases of the disease found during the previous twelve-month period.

Again the Tweed district showed distinct improvement; the decline in cases of bunchy top detected there represents a 16 per cent. drop on the 1947-1948 figures.—DIVISION OF HORTICULTURE.

Good Linseed Crop Expected.

SEASONAL conditions for the young linseed crop have been very favourable. If these conditions continue the area of linseed under crop in 1949-50 in Australia (approximately 40,000 acres) is expected to yield about 15 per cent. of Australia's total requirements (2,000,000 bushels).

This remarkable result has been achieved from an original sowing of only 30 tons of Walsh seed in 1947. Before that time Walsh linseed was not grown on a commercial scale.—DIVISION OF PLANT INDUSTRY.

Hybrid Sweet Corn—Registered Seed Scheme.

A SCHEME has been set in motion by which production of hybrid sweet corn seed is to be brought under similar conditions to those operating for the Field Maize Registered Seed Scheme.

Approved growers will be charged a registration fee of £1 per acre, to assist in defraying expenses incurred in connection with inspections, etc.

Foundation seed will be supplied from departmental experiment farms to growers for their crossing block, at a cost of 4s. per lb.

Further information on this new scheme can be obtained from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

World Census of Agriculture—*continued from page 462.*

on the farm or in the farmer's family; the acreage in the most important crops, including wheat, rice, corn, rye, millet, potatoes and cotton; the number of trees of the most important kinds such as citrus, coffee, bananas; whether work is done with some kind of power or entirely by hand; the number of the most important kinds of livestock and poultry, and the production of milk and eggs.

It is recognised that there are many and wide differences in farming in various parts of the world. Getting the facts in some areas will be harder than in others and in different countries different information will have to be collected. Rice is the most important crop in some countries; in other countries very little is grown. Similarly, wheat is very important in some areas, but only of small importance in others. In Australia it is hard to find a farm which has not either a tractor or at least a team of horses, yet in some countries a farm which has any animal power is exceptional.

Whatever the special needs may be, each government is being asked to work out its plans in such a way that the statistics it gets can be easily compared with those of other countries. For the world as a whole, just as for any individual nation, it is necessary to have the facts.

Thinning the On-Year Apple Crop—*continued from page 478.*

decreased. Thus, while Methoxone may thin these varieties, it does not regulate cropping. Other hormone-type sprays will be investigated for this group.

Fruit Removal Sprays.

Where sprays are required for stripping fruit from the tops of trees or defruiting whole trees, a hormone-type spray at higher strength than thinning strength can be used. Caustic sprays of suitable strength may be used prior to full bloom for complete defruiting[5], although somewhat damaging to the tree.

Precaution.

Growers wishing to try these sprays are recommended to read the detailed results of trials,[3] and to consult their District Fruit Officer, as the strength of spray to use depends on both the variety and the vigour or condition of the trees.

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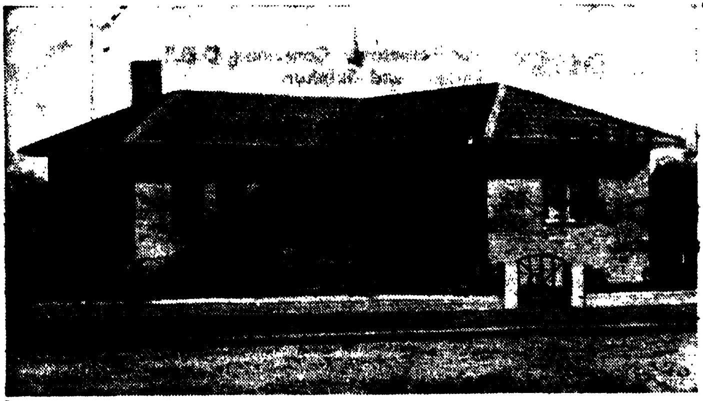

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The Value of DDT in TOMATO PEST CONTROL PROGRAMMES

Central Coast Experiments

P. C. HELY, B.Sc.Agr., Entomologist.

FROM results of a series of experiments conducted by the Department in recent years to determine the pest and disease control programme for tomatoes in Central Coast districts, it has become evident that DDT must form the insecticidal basis. The judicious combination of spraying and dusting methods proved most satisfactory and efficient.

Based on work originally conducted in 1940* the combination of lead arsenate and nicotine sulphate and a weak Bordeaux mixture was the departmental recommendation until 1945, but in 1946 experiments were commenced to test these substances against the newer insecticides, DDT and BHC, which had then become available.

AUTUMN CROP EXPERIMENTS.

The 1946 Results.

Experiments carried out on a staked crop of Break-o-Day tomatoes in the autumn of 1946 consisted of six blocks and six treatments. Nine applications were made at seven to ten-day intervals, commencing on 25th January and ending on 26th April, 1946.

Bordeaux mixture (1 :1 :40) was included in all the spray applications, and colloidal sulphur (½ lb. or 1 lb. to 40 gallons) was included in four of the nine applications in each treatment. In the dust treatment, 10 per cent. of copper carbonate as a fungicide and 40 per cent. sulphur as a miticide were included in the mixture.

The treatments were as follows:—

(A) Lead arsenate 3 lb.: 40 galls., and Bordeaux and colloidal sulphur.

(B) DDT emulsion, 0.06 per cent. DDT, and Bordeaux and colloidal sulphur.

(C) DDT emulsion, 0.03 per cent. DDT, and Bordeaux and colloidal sulphur.

(D) 1 per cent. DDT, 40 per cent. sulphur, 10 per cent. copper sulphate dust.

(E) Bordeaux, colloidal sulphur.

(F) BHC emulsion 0.075 per cent. BHC and Bordeaux and colloidal sulphur.

Two small untreated "pilot plots" were left at opposite corners of the block to check on spray injury and normal pest and disease development.

Thirteen pickings were made between 4th March and 11th June. The fruit was counted, weighed and classed into clean, caterpillar-damaged and potato moth-infested fruits.

The following table shows the mean infestation of tomato caterpillar and potato moth:—

Treatment.	Mean Infestation.	
	Tomato Caterpillar.	Potato Moth.
	Per cent.	Per cent.
A	0·73	0·37
B	0·00	0·03
C	0·13	0·02
D	0·02	0·06
E	6·20	1·04
F	0·49	0·08
Check	10·34	0·94

Discussion.—Tomato caterpillar infestation was not severe, and even in the untreated plots was only 10.34 per cent. It is evident, however, that highly satisfactory control was obtained with routine sprays of DDT at the relatively low concentrations

* Experiments at Mangrove Mountain, conducted by W. L. Morgan and P. C. Hely.

used, and the results are superior to those obtained with the standard lead arsenate programme. The 1 per cent. DDT dust also gave very satisfactory control of this pest.

Benzene hexachloride spray was about equal in effectiveness against tomato caterpillar as lead arsenate.

DDT sprays and dust were effective against potato moth, as was the BHC spray also.

All treatments gave satisfactory control of tomato mite, though the greatest residual value was shown by the dust treatment.

No ill effects on the size, quality or appearance of the fruits was seen, nor was there any evidence of reduction in cropping following the application of any of the treatment programmes.

1947 Autumn Crop Results.

This experiment was commenced on 10th January on a staked and pruned crop of Break-o-Day tomatoes. Six treatments were tested with five replications of each. No untreated plots were included in the randomization, but small "pilot plots" were left at each end of the rows, half of these being sprayed with Bordeaux and dispersible sulphur only, whilst the other half completely untreated.

The treatments used were as follows:—

(A) Bordeaux, dispersible sulphur, DDT emulsion.

(B) Bordeaux, colloidal sulphur, DDT emulsion.

(C) Bordeaux, DDT emulsion.

(D) DDT emulsion.

(E) Bordeaux, dispersible sulphur, DDT water dispersible powder.

(F) Copper carbonate 10 per cent., sulphur 30 per cent., DDT 1 per cent. dust.

(X) Bordeaux, dispersible sulphur.

(Y) "Pilot" plots.

Bordeaux mixture was used generally at 1:1:40, whilst colloidal and dispersible sulphur were each used at the rate of ½ lb.: 40 gals. DDT sprays, both as emulsion and water dispersible powder, were diluted to contain 0.05 per cent. actual DDT.

Fifteen applications of each treatment were made at weekly intervals, concluding in mid-May. Harvesting commenced in April and was continued through to August.

The following table summarises the mean figures for caterpillar, potato moth and early blight infestations:—

Treatment.	Mean Infestation.		
	Tomato Caterpillar.	Potato Moth.	Early Blight.
	Per cent.	Per cent.	Per cent.
A	0·0	0·0	5·5
B	0·03	0·0	7·44
C	0·0	0·0	7·8
D	0·0	0·0	11·67
E	0·14	0·07	7·53
F	1·64	0·0	8·22
X	12·0	0·54	4·2
Y	24·09	2·28	11·98

Summary of Results.—Multiple applications of sprays and dusts containing DDT showed no evidence of injury or any ill-effect on cropping or quality of the fruit. Yields of fruit both in respect to number and quality in all treated plots were highly satisfactory. On untreated plants the size of fruit was substantially reduced, due to attack by tomato mite.

Almost complete control of tomato caterpillar was obtained in all treatments involving the use of DDT sprays, though the emulsion form appeared to be slightly superior to the water dispersible powder in this respect. DDT dust was very satisfactory, but not quite as good as the sprays from the point of view of control of caterpillar. On untreated plants 24 per cent. of the fruits were attacked by this pest.

All treatments gave excellent control of a light infestation of potato moth, whilst complete control of aphids was secured in the sprayed plots. A light infestation of aphids occurred on the dusted plants.

Tomato mite developed very heavily on untreated "pilot" plants and almost completely defoliated them. Despite the close proximity of these heavily-infested plants to adjacent treated plants and the fact that during harvesting operations pickers moved freely from infested to non-infested plants, no mite injury was seen in any of the treated plots. Excellent control of mite was secured with treatment programmes (C) and (D), containing DDT spray at

0.05 per cent. without the addition of sulphur at any time. This effect of routine DDT treatments on control of tomato mite confirms previous experience in the spring experiments and supports results reported by Friend* in 1945. It would appear necessary, however, that in such routine spraying care must be taken to spray the main stem on each occasion.

SPRING CROP EXPERIMENTS.

In the spring of 1946 an experiment was carried out in a block of Rouge de Marmande unstaked tomatoes. Seven treatments and untreated checks were randomised, allowing eight replications.

As outstanding results had been obtained in the control of *Thrips tabaci* on onions during the previous season by the use of DDT sprays†, and as this insect is known to be one of the principal vectors of the tomato spotted wilt virus, it was hoped that routine sprays of this material might have an important influence in reducing losses from this very serious disease of spring-grown tomatoes.

The treatments used were:—

(A) Mayonnaise emulsion 0.1 per cent. DDT.

(B) BHC dust 2 per cent.

(C) Miscible emulsion 0.1 per cent. DDT.

(D) Miscible emulsion 0.05 per cent. DDT.

(E) "Phenyle" 2 fl. oz. per gallon.

(F) DDT dust 2 per cent.

(G) Mayonnaise emulsion 0.05 per cent. DDT.

(H) Untreated checks.

Ten applications at weekly intervals were made between 16th October and 19th December commencing about two weeks after the plants were set out in the field. All plants used in the experiment had been sprayed at weekly intervals whilst in the seed bed with 0.1 per cent. DDT emulsion.

Results.—Unfortunately, owing to severe heat wave conditions which caused severe sunburning of much fruit, and to the fact that the crop matured during the market holiday period, it was not practicable to make a satisfactory count and classification of the crop.

Spotted wilt first showed up between 17th and 22nd October, and from then on all plants so affected were charted at weekly intervals but were allowed to remain in position until 4th December, when all affected plants were removed. The mean percentages of spotted wilt infected plants in each treatment are shown in the following table:—

Treatment.	Mean Percentage of Spotted Wilt-affected Plants.	
(A) Mayonnaise emulsion 0·1 per cent. DDT.	43·05	Average of DDT. spray treatments, 39·45 per cent.
(G) Mayonnaise emulsion 0·05 per cent. DDT.	36·84	
(C) Miscible emulsion 0·1 per cent. DDT.	34·56	
(D) Miscible emulsion 0·05 per cent. DDT.	43·35	
(F) 2 per cent. DDT. dust ...	52·40	
(E) Phenyle	66·35	Average of ineffective treatments and checks 69·04 per cent.
(B) 2 per cent. BHC. dust ...	67·34	
(H) Untreated	7[illegible]5	

Whilst the percentage of spotted wilt infection was high in all plots, there does appear evidence of appreciable control as a result of routine application of DDT sprays. Probably the most satisfactory picture is obtained by averaging the mean percentage figures for the four DDT spray treatments.

The BHC dust and Phenyle sprays were obviously of little value for the control of spotted wilt.

Spring Crop Experiments, 1947.

In the spring of 1947 five treatment programmes were replicated six times in an unstaked crop of Rouge de Marmande tomatoes set out in rows eight feet apart in early October. All plants were sprayed twice weekly with DDT 0.1 per cent. in the seed-bed and between planting out and 22nd October, when experimental treatments were commenced. Between the commencement of the experiment and its conclusion on 22nd December, when the last treatment was applied, seventeen applications were given. No re-treatment was given when rain followed any treatment.

Each treatment consisted of two parts—and these were applied alternately every Monday and Thursday throughout the period of the experiment.

* *Agr. Gazette of N.S.W.*, 56: 456.
† *Agr. Gazette of N.S.W.*, 56: 467.

The treatments were:—

A—(1) DDT-Bordeaux mixture; (2) Tartar emetic-sugar.

B—(1) DDT-Bordeaux mixture; (2) DDT 0.05 per cent. emulsion.

C—(1) DDT-Bordeaux mixture; (2) DDT 1 per cent. dust.

D—(1) DDT-Bordeaux mixture; (2) No treatment.

E—(1) DDT 1.5 per cent.-copper carbonate; (2) Tartar emetic-sugar.

X—(1) DDT 0.1 per cent.-Bordeaux mixture; (2) DDT 0.1 per cent.

Y—Untreated except for an occasional spray of Bordeaux mixture.

All spray treatments included Bordeaux mixture (1:1:40) and 0.05 per cent. DDT, except where otherwise stated. The dust treatment included 10 per cent. copper carbonate as the fungicide, and the tartar emetic bait sprays consisted of 1 oz. tartar emetic, 4 oz. white sugar and 4 gallons of water.

When sprays including Bordeaux were applied, the whole plant was thoroughly sprayed, but those not containing Bordeaux mixture were largely made as top sprays over the upper part of the plant.

Results.—Unfortunately heavy rains, which caused water-logging of some of the plots, occurred in mid-December and made it impossible to continue the experiment as planned. In any case tomato caterpillar and tomato mite development were so slight in the untreated sections that no results were forthcoming from the experiment in regard to these pests.

Some little foliage scorch occurred on plants receiving alternating sprays and dusts containing DDT, but otherwise little injury was noted.

The positive results therefore were largely confined to the variation in spotted wilt infection in the different plots, and these are set out in the following table:—

Treatment.	Percentage of of Plants with Spotted Wilt.
	Per cent.
A	10·79
B	10·65
C	10·09
D	17·06
E	11·71
X	4·5
Y	30·57

From the amount of spotted wilt in the untreated plots it is apparent that infection was only moderate. This may have been higher had these plants not received routine DDT spraying in their early stages.

In all treatments involving twice weekly treatments there was a decided reduction in spotted wilt infection, there being little to choose between treatments in which tartar emetic and sugar, 1 per cent. DDT dust and 0.05 per cent. spray alternated with a spray of 0.05 per cent. DDT, Bordeaux (1:1:40). Results were not quite so satisfactory where tartar emetic and sugar spray bait alternated with a dust containing 1½ per cent. DDT and copper carbonate. As compared with the untreated plants, weekly applications of 0.05 per cent. DDT spray gave an appreciable measure of control of spotted wilt, but were markedly inferior to the twice weekly treatments.

DDT Residue on Harvested Fruits.

Samples of fruits from plants treated with different spray and dust programmes were analysed for DDT residue by the Chief Chemist at different times throughout these experiments.

After twenty applications of 0.1 per cent. DDT spray over an eleven-week period, DDT residue was determined as one part per million as weight of fruit. After a similar number of alternating dust and spray applications the residue amounted to two parts per million.

On another occasion tomatoes treated fifteen times with combinations of 0.05 per cent. DDT with different materials in spray form or with 1 per cent. DDT dust combined with sulphur and copper carbonate, showed less than 1 part per million DDT. These residues are well below any tolerance limit likely to be set for DDT.

RECOMMENDATIONS.

From the results of this series of experiments it is evident that DDT must naturally form the insecticidal basis of any tomato pest control programme under Central Coast conditions. As a spray it can be satisfactorily combined with Bordeaux mixture fungicide and also with some forms of sulphur, though the dispersible form would appear to be the safest and most satisfactory

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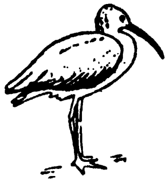

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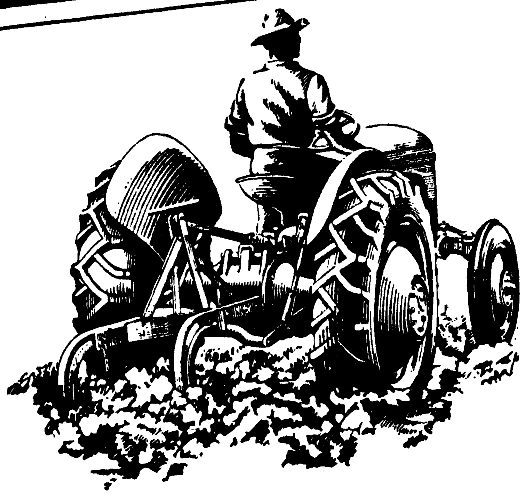

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sulphur for use in such combinations. DDT may be used as a spray either as an emulsion or as a wettable powder, but though both are effective, emulsion forms of DDT appear slightly better for tomato pest control.

Where routine sprays are thoroughly performed a simple combination of Bordeaux mixture 1 :1 :40 and DDT at 0.05 per cent. offers a highly effective and safe spray for control of insect pests, fungous diseases and tomato mite. Sprays containing DDT should form the basis of any spray programme having spotted wilt control as its object, though in this regard the concentration should be 0.1 per cent. DDT.

Dusts containing 1-2 per cent. DDT may be satisfactorily combined with sulphur and copper fungicide, and though not quite so effective against some tomato pests as the DDT sprays, nevertheless have much to commend them. As some tendency to cause foliage scorch of young plants is shown by such dusts, it is preferable that such plants be sprayed until they are about a foot high, after which a dusting programme may be adopted.

A judicious combination of both the spraying and dusting methods, in any case, offers the most satisfactory and efficient programme.

Acknowledgment.

The writer is indebted to Mr. A. R. Studds, "Allambie," Somersby, whose active interest, practical co-operation and advice have contributed materially to the results obtained in this series of experiments.

Breach of Swine Compensation Act—Sydney Firm Convicted.

A SYDNEY firm was recently convicted and fined £5 with court costs for failing to comply with section 13 (2) of the Swine Compensation Act, 1928-35, requiring duty stamps to be affixed to the Register at Homebush Abattoir in respect of pigs delivered for slaughter.

In making this announcement, the Acting Minister for Agriculture, Hon. W. F. Sheahan, M.L.A., said that the section of the Swine Compensation Act referred to reads:—

"Within fourteen days after the delivery of a pig at an abattoir for slaughter the person on whose behalf the pig is so delivered shall affix to such record Swine Duty Stamps as prescribed by the Swine Compensation Taxation Act, 1928, or the Swine Compensation Taxation Act, 1935, in respect of the pig so delivered and shall cancel such stamps in the manner prescribed by regulations made under the Stamp Duties Act, 1920-33, as amended by subsequent Acts."

Mr. Sheahan drew attention to a further provision of the Act that no compensation or only such part of the compensation otherwise payable as the Chief Veterinary Surgeon thinks reasonable, shall be payable to any owner if, within the period of two years preceding the date of his application for compensation, he has been convicted of an offence against the Act or the Regulations. Inspectors of the Department of Agriculture, he said, had been instructed to keep a close watch for any breaches of the Act in future.

"All persons concerned are warned that where breaches of the Act requiring the affixing of Swine Duty Stamps are detected, the Department will take legal action," concluded the Minister.

2,4,5—T Gives Promising Results as a Weedicide.

RECENT trials by agronomists at Glen Innes, Mudgee, Orange and in the Metropolitan Area with a new hormone-type weedicide known as 2,4,5—Trichloro-acetic acid, have indicated that 2,4,5—T is likely to prove very effective for control of blackberries—kills in excess of 90 per cent. having been obtained on several occasions from single applications.

It appears that 3 to 5 lb. of 2,4,5—T are sufficient for one acre of blackberries. This amount, mixed with 100 to 150 gallons of water, has been applied as a spray so as to wet the leaves and stems thoroughly. Spring and summer applications have been successful to date. Further trials are in progress using various formulations of the chemical to determine the best formula, and time, rate and method of application.

2,4,5—T is also being tested on a number of other weeds, including sweet briar, hemp agrimony, lantana and bracken. American reports indicate that 2,4,5—T is less toxic to herbaceous weeds than are the various 2,4—D preparations, but is useful for the control of certain shrubs.

This weedicide is not yet generally available to the public, but full supplies are expected to be available in the near future.

Examining the Work of a Young Queen Bee.

APIARY NOTES

HONEY FLOW PROSPECTS
Are Poor

Eucalypt Bud Development is Light and Scattered

W. A. GOODACRE, Principal Livestock Officer (Apiculture).

THE honey flow prospects for the coming season, extending from September to April, 1950, inclusively, are not very encouraging, and beekeepers will require to plan carefully any movements of bees within their own districts or further afield to secure payable crops of honey. The light and scattered nature of bud development—on which estimates of future production are mainly based—indicates that very few of the main honey-yielding Eucalypts will flower next spring and summer. Most of the prominent species of Eucalypts flowered last season and provided a record production, and it is characteristic of many of them only to build up new foliage growth for bud development and flowering every second or third year. Amongst these species are the famous honey trees, the Yellow Box (*E. melliodora*) of the inland, and Grey Ironbark (*E. paniculata*) of the coastal divisions. Both species flowered profusely during the past season.

Apiary inspectors operating in the Central Tableland division, however, report that the Red Stringybark (*Eucalyptus macrorrhyncha*) is making a good show of buds to flower from late February and March, 1950. It did not flower during the past season. This species can usually be relied upon as a honey producer. The quality of the honey is a fairly good second grade, which is useful for blending with choice grade. With the extensive production of choice grade honey last season, of which a large quantity will be held over, it should be possible to make good use in blending work of any production from this stringybark.

Ground Flora May Prove Useful.

In view of the meagre prospects on the general run of favoured beekeeping country, it appears worthwhile to make inspections over areas outside this field. These generally less-favoured areas may include mountain ranges where a different variety of flora exists. Also, if the rainfall is favourable, those districts where a good growth of ground flora occurs, such as clover on the North Coast river country, and lucerne, Paterson's Curse weed, and St. Barnaby's thistle on the central and southern tablelands, may provide an extraction or two of honey. It must be kept in mind, however, that the ground flora areas are somewhat limited, and cannot be expected to accommodate all apiaries which it may be desired to move into them. In view of the likelihood of overcrowding, and the consequent reduction in the quantity of honey to be obtained from ground flora, it may not pay beekeepers to make any long distance moves to contact these species of plants.

White clover, which grows naturally on river flats on the North Coast, may be expected to flower during spring, and extend to the early summer, whilst Paterson's Curse, commonly known as "Blue Weed", usually comes in during the late spring and continues to flower into the summer months. St. Barnaby's thistle is a summer-flowering species

Need to Ensure Maturity.

Honey produced from these ground flora plants, although of good quality, usually has a fairly high moisture content. It is therefore most important that the bees be given time to complete capping of the honey in the combs before it is extracted. If given proper attention in this way the honey produced will have good keeping qualities, and will be well received on the market, where it can be used for making up special candied lines and in blending operations for both the local and export trade.

Other Species Worth Observing.

There are a few useful honey trees which produce their buds and flower all within a few weeks, and it is not, of course, possible to assess the value of them at this early period of the season. The best of these are Brush Box (*Tristania conferta*), Grey Box (*Eucalyptus hemiphloia*) and Bloodwood (*E. corymbosa* syn. *gummifera*), all of the coastal regions, and their main flowering periods are respectively November, February and March. The honey flow prospects on these trees, when their flowering period is near at hand, are worthwhile keeping under observation.

Points in Introducing Queen Bees

TO raise the standard of bees in the apiary, or even to maintain a good standard of breeding, it is necessary to make at least an occasional purchase of queen bees from a reliable queen bee-breeding station. A discussion of some aspects of the introduction of queen bees received by mail should be of interest at this early period of active seasonal work, particularly to young beekeepers.

Queen bees can be successfully introduced at any period from the early spring to late autumn, but selection of the colonies in which the new queens are to be placed is important. For instance the introduction of a queen bee received by mail to a colony of bees with, or likely to have, swarming tendencies should be avoided. It is best to introduce the new queen to a contented, medium-strength colony not likely to swarm. This applies particularly during the late spring—the main swarming period.

Inspect the Hive Carefully.

Other matters which need to be considered are:—

(*a*) Do not remove the old queen until the new one comes to hand. For some reason or other the queen breeder may be delayed in despatching the queen on the date arranged, or, on rare occasions, something may happen to the queen en route, and she is found dead on arrival.

(b) Make sure by careful inspection that the colony to which the queen is to be introduced is queenless, and that the bees are not building supersedure queen cells. It is not altogether uncommon, where an old queen is established in a hive, for the bees to prepare to supersede her. In such an instance it will be found that one or two queen cells have been built up for the purpose, or in odd instances the supersedure may have been completed and both the old queen and the young one raised to replace her at present. Introduction of a new queen to any colony showing a tendency to supersede should be avoided. Such colony should be allowed to settle down properly to a normal contented state before being disturbed.

Introducing a Queen Bee in a Miller Type Cage.

To Assist Release of an Introduced Queen.

On receiving the queen and escort in a mailing cage it is usually found that the food compartment is almost full of candy, and the release of the queen by the colony, without assistance, may be unduly delayed. It is a good plan, therefore, after removing the cork from the candy end of the cage, as advised in the directions sent with the queen, to make a hole carefully straight through the candy with a 2-inch nail of average gauge. The bees from both the colony and the cage eat their way straight through the candy supply, guided by the small opening, and introduction is accomplished within reasonable time.

Introduction to a "Temperamental" Colony.

On introducing a queen bee in a mailing cage to a temperamental colony, it is a good practice first to remove the escort bees and replace them with fairly young workers from the colony to which the introduction is to be made. These youngsters will not create any disturbance likely to affect the strange queen's acceptance, as may be the case with strange worker escorts.

Transferring Queen Bees to Another Type of Cage.

Many prominent beekeepers prefer to introduce queen bees without escorts in a Miller type cage. This is a very effective and simple method of introducing stock from nucleus colonies raised at home. Where queens are received by mail, and it is desired to transfer them to Miller cages for introduction, it is best to carry out the transferring work in a closed room near a window to prevent risk of the queen escaping. She may be allowed to crawl out on to the lower portion of the window where she can be easily caught. At times the queen can be caught when emerging from the opened cage before getting on to the window.

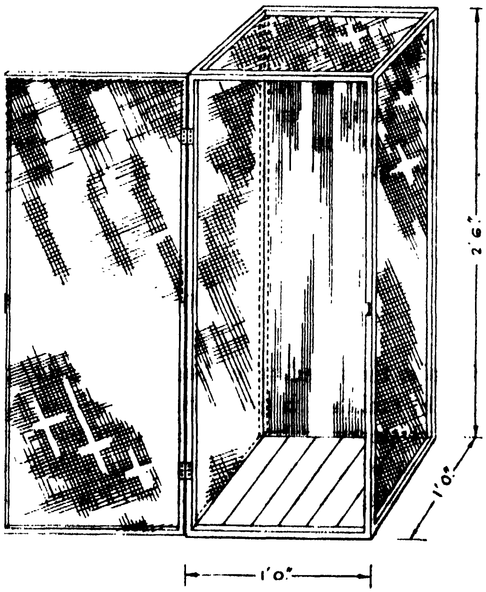

Diagram of Simple Bee-catching Safe.

When catching queen bees received from overseas for transfer to a fresh cage, as required under quarantine regulations, a

(Continued on page 503.)

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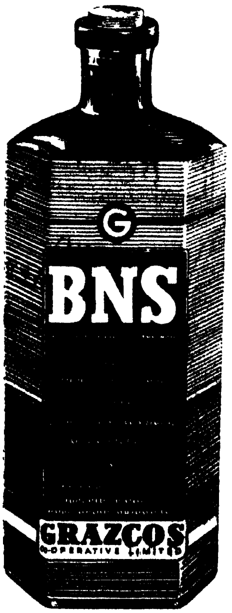

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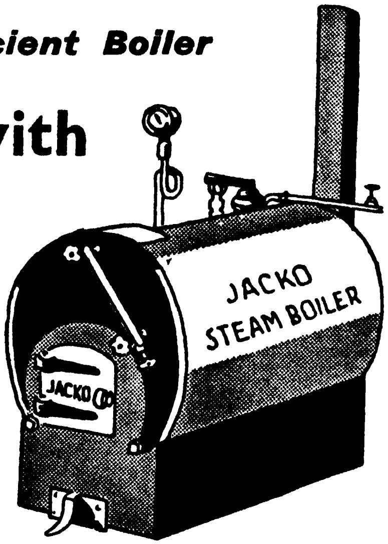

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CATTLE BREEDING BY AIR MAIL

Aspects and Prospects of Artificial Insemination in Australia

H. E. R. BEATTIE, B.V.Sc., Veterinary Research Officer,
Veterinary Research Station, Glenfield.

IN this article the author discusses the potential influence of artificial insemination on the improvement of dairy cattle production in Australia, and indicates the difficulties that must be overcome before efficient and economic use can be made of this method of breeding.

Results are quoted of the sending of small- and large-scale consignments of semen from and to Australia, and conclusions are drawn from these as to the prospects for and the requirements of the method in Australia.

Methods employed by animal husbandmen in the past have produced our present excellent breeds of livestock. A stage has now been reached where the productive capacity of many dairy cattle herds can be increased only very slowly, if at all, by the continued application of such methods, and even maintenance of the present standards will not be easy.

Herd recording and progeny testing are destined to play an increasing part in future breeding programmes. By such means we can discover and discard those bulls which—despite an attractive appearance and an impressive pedigree—are actually lowering herd standards. Approximately one-third of our bulls probably fall into this category, and another third into a group which just about maintains the present production potential. It is, therefore, obvious that many bulls are being employed whose influence is not improving production; otherwise there would not be sufficient to go round.

By the judicious application of artificial insemination, it might be quite practicable eventually, even in Australia, to draw sires only from the remaining one-third of the bulls, all of which would be herd improvers or merit sires. Theoretically all the cows in the country could be covered by the top 10 per cent. or so of our sires. This policy, if put into effect, would result in a rapid improvement in production, if combined with adequate feeding and suitable management. Practical difficulties render this impossible, and in any case the wisdom of adopting such a restricted breeding programme would be open to question.

The Experience of Denmark.

In Denmark, where production figures are about twice as good as ours, three-quarters of the cows are now being bred artificially. Dairy herds in that country are so small that farmers generally welcome any alternative to keeping a bull, even without the additional attraction of the high standard of sires used by the artificial insemination centres. On the basis of 30s. a head, the Danish farmer would probably pay the equivalent of £10 to £20 a year for artificial insemination, whereas the cost to the average Australian with his larger herd would be more like £50 to £100. For a smaller sum than this the Australian farmer could purchase a bull of his own selection—which "should be good," and in some cases would be—and use him for several years.

In view of this fact, among others, it is not surprising that difficulty should be experienced in finding any dairying area in which sufficient farmers would guarantee such immediate practical support as to warrant the establishment of a costly artificial insemination centre.

Knowledge and technique are improving all the time, so that when artificial insemination does become more widespread in Australia we will not simply be commencing where various other countries started years ago. We will be in a position to benefit by their experience. Meanwhile we can continue to work on the problems of how best to adapt artificial insemination to Australian conditions.

Experiences with Air Transport.

Not the least among these problems are those associated with distance. Air transport immediately suggests itself as a means of minimising distance difficulties. It has a place, and can be used to advantage, but it is subject to greater limitations than might at first be realised. Glenfield Veterinary Research Station has carried out and/or taken part in various artificial insemination long-distance transportation experiments in recent years. Some particulars regarding these, and the difficulties encountered, should be of fairly general interest and should give a better understanding of what is involved.

An Early Exchange Between New South Wales and New Zealand.

During August, 1944, six cows at Camden Park, New South Wales, were inseminated with male fluid flown from New Zealand, and six in New Zealand with semen from a bull in New South Wales. In each case four calves were subsequently born. The collection, dilution and packing of the semen samples were carried out by officers of the Glenfield and Ruakura Research Stations respectively, as also were the inseminations. On both journeys the packages were taken personally by Mr. H. J. Geddes, of the McGarvie Smith Animal Husbandry Farm, who had made arrangements with the co-operating institutions in Australia and New Zealand.

U.S.A. to Australia—New Long-Distance Record Established.

In October, 1946, semen from "Regal Heritage"—a noted Jersey sire owned by Mr. Thos. Erwin of Pennsylvania, U.S.A., and used in the breeding programme of the Co-operative Breeding Association No. 1, of Clinton, New Jersey—was received at Glenfield after having been flown to Sydney, via London. On arrival at Glenfield it was examined, further diluted, divided, re-packed and distributed to Victoria, Tasmania, and various parts of New South Wales. In due course about ten calves were born—including one whose mother had been inseminated in Tasmania and then shipped to Victoria while pregnant.

In the case of this experiment, the main object was to test the efficacy of two methods designed to maintain low temperatures in transit. The route taken via London, namely seven days, was too prolonged and the desired cool temperature within the container was not maintained.

In New South Wales, the first insemination was carried out at Glenfield the evening the samples arrived. The owner of the cow, Mr. Sales, of Belgrave Jersey Stud, Paterson, N.S.W., had brought the animal to the Research Station for the purpose. She subsequently calved, but a second cow inseminated on his property failed to conceive. All the other cows which conceived were inseminated by the tenth day. Much of the material distributed from Glenfield was not used at all, and many of the inseminations were carried out when the semen was ten days old or more—owing to transport difficulties and the lack of cows in season when the packages first arrived.

The only calf close enough to Glenfield to allow of inspection was one born at Mr. C. R. G. MacDonald's Brighton Jersey Stud, Ingleburn. This cow had been inseminated by Mr. G. J. Fisher on the eighth day. Mr. W. R. Sidman, of Camden, obtained three doses for cows owned by Mr. Booth, then of Narellan. It is understood that one of these held, one returned, and the third—in which heat had been induced artificially—was doubtful. Mr. Booth moved to another district soon afterwards, and we have not yet heard the final outcome.

Great credit is due to Mr. D. S. Wishart, of the State Research Farm, Werribee, Victoria, whose use of the imported semen resulted in the birth of five calves following fourteen inseminations carried out. He waited up all night for the consignment, and immediately toured the properties of co-operating farmers in search of cows in season. Messrs. E. and M. I. Parkes' Irona Stud, Trafalgar, and the Hartley Jersey Stud, Dandenong, were among these properties.

New A.I.S. "Blood" to New Zealand, Despite the Embargo and Quarantine Restrictions.

In October, 1947, several consignments of semen from Mr. Grahame Shirley's "Camelot Victory" were sent from Glenfield to Ruakura, as a result of which a dozen or so calves were born on various farms in New Zealand in 1948. Reports received to date indicate that the farmers are very pleased with these calves, but we had hoped for a larger number.

This was really an attempt at larger scale operations than had been undertaken previously. Many New Zealand breeders are interested in Australian Illawarra Shorthorn cattle, on which "blood" some of their herds are based, but on account of pleuro-pneumonia contagiosa, New Zealand imposed an embargo on the importation of Australian cattle many years ago.

During a visit to New Zealand Mr. Shirley had discussed artificial insemination possibilities with breeders and with Dr. C. P. McMeekan of the Ruakura Animal Researdh Station. Tentative arrangements were made and the New South Wales Department of Agriculture agreed that Glenfield should co-operate in carrying out an experiment—though this was not to be taken as a precedent, automatically to be followed upon the receipt of any similar requests in the future.

After having been tested and found free from various diseases, the bull was floated from Penrith to Glenfield, where he was trained to serve the apparatus used in collecting suitable semen samples. This training took a few weeks in this instance, as is frequently the case.

All being in readiness, plans were made to collect on certain days—necessarily governed by transport time-tables, etc., to a greater extent than by expected oestrum dates of selected cows. These plans then had to be modified because of such circumstances as an interruption in the 'plane service due to inclement weather, a public holiday in New South Wales, and Show activities in New Zealand.

Although the major part of the distance is covered rapidly by air, the total time taken from bull to cows can be surprisingly long. As aircraft for New Zealand leave early in the morning from Sydney, the collection must be made by noon on the preceding day, to allow time for laboratory examination (and a second collection if necessary), dilution, special packing, and transportation to the freight office by 5 p.m. Then, in New Zealand, the material has to be taken to a suitably-equipped laboratory for examination and repacking, and sent on to various country centres. Finally, there is the transport to the farms, where the sample should be kept in a refrigerator until cows are in a suitable stage of the oestrus cycle. Even when handled and stored under ideal conditions the chances of success diminish rather rapidly after the semen is four or five days old.

The quantity of fluid forwarded from Glenfield should have been sufficient for at least 100 inseminations, provided that every "dose" had been used, and that in all cases the cows were healthy and had come "on heat" while the semen was fresh. Actually three of the vacuum flasks were broken in transit, and others arrived late because of time-table changes. Also, on one farm, cows which had been returning to the bull were used, and in some cases unsuccessful attempts were made to bring cows on heat artificially rather than not use the semen at all. In view of these and other similar circumstances it is not surprising that only about forty cows were inseminated and about twelve calves born.

In neither of these cases—U.S.A. to Australia and the 1947 Australia to New Zealand consignments—were the results comparable with those obtained in the earlier small-scale experiment in which the packages had been carried in the personal charge of an interested party between Australia and New Zealand.

Association with Feeding, Recording and Sterility.

Farmers who profess an interest in artificial insemination might ask themselves whether they are already giving adequate attention to feeding, whether they would be prepared to raise their own replacements, and to take advantage of herd recording; also to what extent their interest might be related to sterility troubles.

Anyone wishing to study this subject further, and with particular reference to its application in the United Kingdom, would find some very interesting information in an article by Joseph Edwards in the *British*

Agricultural Bulletin, Vol. 1, No. 3 (Autumn, 1948, p. 97). In the United Kingdom the artificial insemination centres do not undertake to deal with sterility problems, but co-operate with veterinary practitioners and government sterility officers to the extent of making relevant records available. The national insemination fee is £1 5s., and it is hoped that Centres will become self-supporting within a few years. Anticipating a probable membership of 40 per cent. in any given area, limiting each Centre to 30 bulls, and working on a basis of 1,000 cows per bull per year, it is estimated that each "block" of 75,000 cows calls for a separate Centre. In view of recent advances the possibility of 5,000 or more daughters annually from each bull is foreseen.

Such figures serve to emphasize the great importance of knowing as much as possible regarding the transmitting values of the sires. Nearly 500,000 cows are being recorded annually at present, and their lactation yields are made available to the Bureau of Records, which in turn provides the artificial insemination movement with necessary information. Incidentally, of the 160,000 English and Welsh "whole milk" farmers, who are members of the Milk Marketing Board, more than 100,000 have herds of fifteen cows or less.

Though early in the field with fundamental research, Britain was late in employing artificial insemination on a large scale. Its use is now spreading spectacularly. This is not likely to happen in Australia in the near future, if at all.

At the worst, however, we should, in due course, be able to benefit indirectly by the introduction of improved stock, preferably from climatically similar zones, and perhaps from the use of artificial insemination at some of our larger studs.

Conclusions.

These trials would seem to indicate that it should be possible to introduce semen to Australia from almost any part of the world and to get some calves, but that at present it would not be practicable to use such means for large-scale breeding programmes where great distances were involved. Perhaps the periodical production of local sons of proven overseas sires by this means could be of great benefit to the dairying industry in Australia.

Any scheme to utilise existing air services as integral parts of artificial insemination programmes within Australia would meet with difficulties such as those outlined above. Air transport might be helpful as a means of carrying regular supplies from large collecting centres to smaller distributing centres; and such centres could be established wherever there was sufficient demand for them. While only a few farmers in any district want such a service, however, and a proportion of these would wish to use artificial insemination in conjunction with natural breeding rather than in place of it, the provision of such a service would be difficult and the cost probably prohibitive.

Veterinary graduates are settling in country districts in ever-increasing numbers, and all students are now gaining some experience in artificial insemination technique prior to graduation. Thus it might appear that soon, any farmer wishing to mate one of his cows with a given bull—say an imported sire stationed at Glenfield—could do so by arranging for semen to be sent to him and for the operation to be carried out by a practising veterinarian, or by a Departmental Veterinary Officer or an Inspector of Stock. However, it would rarely be possible to get word through to Glenfield and to receive the required material therefrom within twenty-four hours of the first appearance of signs of heat in the cow, as would be necessary.

If artificial insemination is to be carried out to any extent in this State, the main question at the moment seems to be whether there should be one or two large collecting centres supplying semen regularly to several scattered inseminating centres, or whether a collecting and inseminating centre in each dairying district should be the aim. In the latter case bulls could be interchanged from time to time, and in the former discretion could be exercised in the matter of which semen to send to each subsidiary centre as the programme progressed; but in neither case could the individual farmer nominate the bull to be used for his cows.

Given organised groups of dairy farmers prepared to pay the cost, such services could be provided. Otherwise the prospects for artificial insemination in Australia are not bright.

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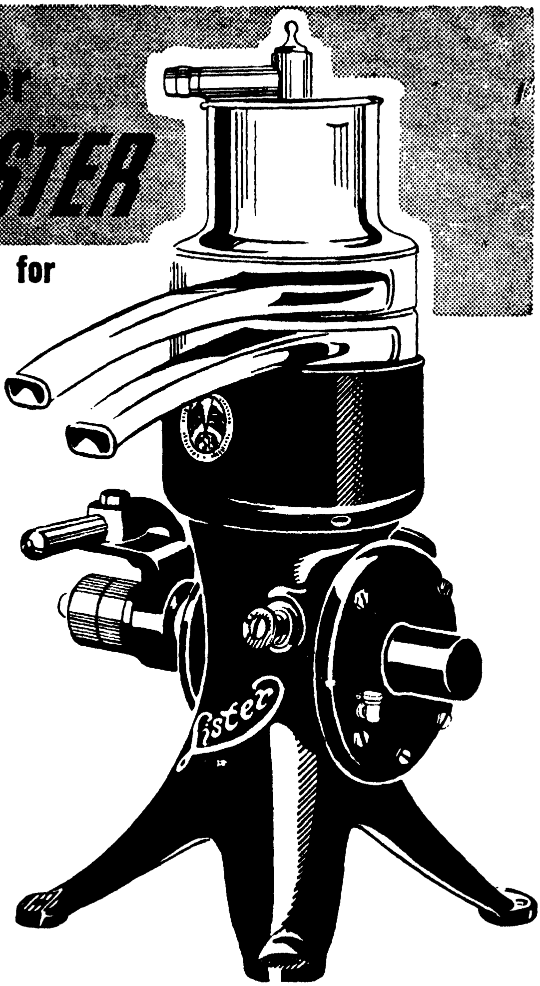

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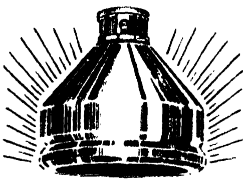

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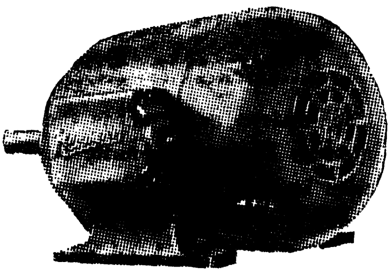

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POULTRY NOTES

TABLE POULTRY EXPERIMENTS
At Hawkesbury Agricultural College

E. HADLINGTON, Principal Livestock Officer (Poultry), and J. H. GULLIFORD, Livestock Officer (Poultry).

IN order to compare the cost of rearing Australorps and White Leghorns to a marketable age of twelve to sixteen weeks, and also to compare the battery system of rearing with ordinary methods, an experiment was carried out last year at Hawkesbury Agricultural College. The experiment commenced on 27th August, 1948, with 800 sexed day-old cockerels (400 Australorps and 400 White Leghorns) and concluded on 17th December, when the birds were sixteen weeks old.

The results showed that although there was no appreciable difference in the cost of feeding by the two systems, and in the return over cost of feeding in the case of White Leghorns, there was a decided advantage in favour of ordinary raising methods in return over feeding cost in the case of Australorps.

The Procedure Adopted.

The 800 sexed day-old cockerels were randomised into two groups (A. and B.), each group consisting of eight lots. They were then treated as follows:—

Group A.—Ordinary Methods of Rearing.

(1) 400 day-old cockerels (200 Australorps and 200 White Leghorns) were apportioned, in lots of fifty, to eight sections of a hot water circulating brooder, four lots of each breed.

(2) Transferred at 6 weeks old to weaning pens, in lots of fifty less mortalities (four lots of each breed).

(3) Transferred at 12 weeks old to single colony sheds (again in the same lots).

Group B.—Battery System of Rearing.

(1) 400 day-old cockerels (200 Australorps and 200 White Leghorns) were placed, in lots of fifty, in eight sections of an electric battery brooder (four lots of each breed).

(2) Transferred to unheated cockerel batteries (24 inches by 27 inches by 24 inches) at 6 weeks old. The birds were divided into equal numbers as nearly as possible, but not more than ten were placed in each compartment. By this means the separate identity of each lot was maintained. The actual number of birds in each compartment varied from seven to ten.

The Method of Feeding.

The chickens were fasted for 36 hours after hatching, and then throughout the remainder of the experiment were fed on an "all mash" ration consisting of:—

Wheat meal	34 lb.
Pollard	20 lb.
Bran	15 lb.
Ground oats	10 lb.
Meat meal (48% protein)	15 lb.
Whey powder	5 lb.
Salt	1 lb.
Total	100 lb.

Plus Vitamin A and D Oil.

No green feed was given throughout the experiment, but a vitaminised oil containing both vitamin A and vitamin D was added to the mash in the usual proportions. The feed was mixed weekly to ensure that the potency of the vitamin oil was maintained.

The average weights per birds in the different groups at four weekly periods are shown in Table 1.

TABLE 1.—WEIGHT OF BIRDS.

Age.	White Leghorns.		Australorps.	
	Group A (Ordinary Methods).	Group B (Battery System).	Group A (Ordinary Methods).	Group B (Battery System).
	lb.	lb.	lb.	lb.
4 weeks ...	0·54	0·50	0·46	0·48
8 weeks ...	1·51	1·43	1·49	1·31
12 weeks ...	2·68	2·82	2·93	2·81
16 weeks ...	3·53	3·60	4·14	3·96

Growth of White Leghorns at 12 weeks of age in Group B (battery system) was somewhat greater than that of White Leghorns in Group A (ordinary methods), but at 16 weeks the difference was practically negligible. The Australorps showed slightly better growth in Group A (ordinary methods) right through the experiment.

Return Over Feed Cost.

At 12 and 16 weeks of age an estimate was made of the market value of the birds at the rate of 1s. 10d. per lb. live weight, being the price paid under commercial conditions at the time for cockerels. The cost of feeding was assessed on the basis of £14 per ton.

The figures for the return over cost of feeding are shown in Table 2.

TABLE 2.—COST OF FOOD, MARKET VALUE OF BIRDS AND RETURN OVER FEED COST.

	White Leghorns.				Australorps.			
	Group A (Ordinary Methods).		Group B (Battery System).		Group A (Ordinary Methods).		Group B (Battery System).	
	12 weeks.	16 weeks.	12 weeks.	16 weeks.	12 weeks.	16 weeks.	12 weeks.	16 weeks.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Cost of food per bird ...	1 4.8	2 3.2	1 7.4	2 7.2	1 5.2	2 4.3	1 8.0	2 10.1
Value per bird	4 11	6 5.7	5 2	6 7.2	5 4.5	7 7	5 1.8	7 3.1
Return over cost of feed ...	3 6.2	4 3.4	3 6.6	4 0	3 11.2	5 1.9	3 5.8	4 5.1

THE RESULTS OBTAINED.

Weight of Birds.

Group weighings were made at 4, 8, 12 and 16 weeks, and individual weighings at 6, 12 and 16 weeks.

Food Consumption.

Food consumption for the different groups at four-weekly intervals is shown in Table 3. The weights shown are for 100 birds and are based on actual food consumption for each group.

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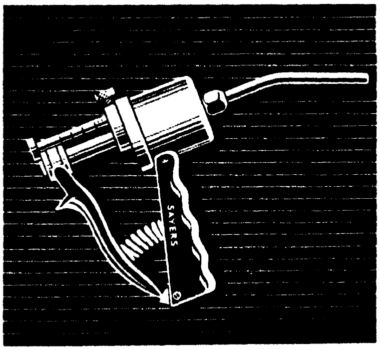

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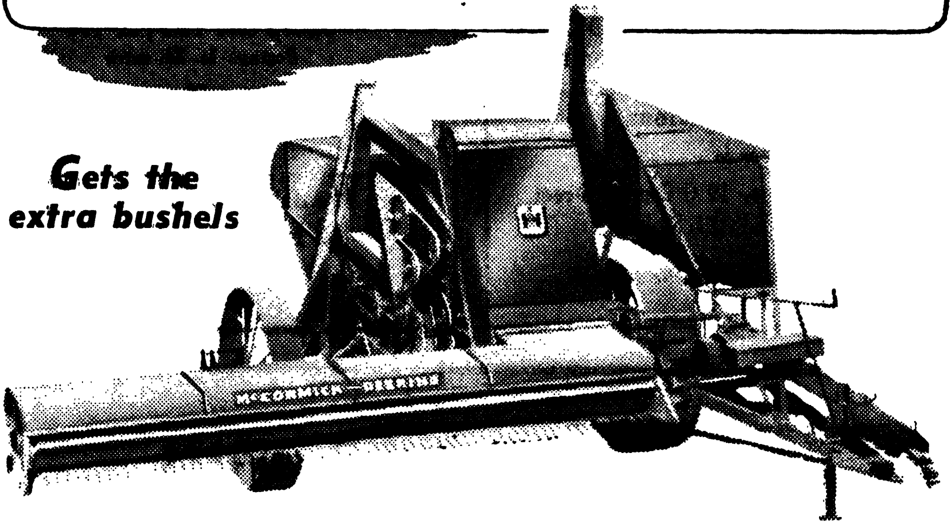

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TABLE 3.—WEIGHT OF FOOD CONSUMED PER 100 BIRDS.

Period.	White Leghorns. Group A (Ordinary Methods).	White Leghorns. Group B (Battery System).	Australorps. Group A (Ordinary Methods).	Australorps. Group B (Battery System).
	lb.	lb.	lb.	lb.
1–4 weeks	128	141	113	122
5–8 weeks	350	390	350	381
9–12 weeks	521	628	566	691
13–16 weeks	576	699	660	836
1–16 weeks	1,575	1,858	1,689	2,030

It will be noted that the food consumption of Australorps was greater than White Leghorns from 9 weeks onwards in both groups. Over the 16 weeks period Australorps consumed 114 lb. per 100 birds more than White Leghorns in Group A (ordinary methods) and 172 lb. per 100 birds in Group B (battery system). In both breeds food consumption in Group B (battery system) was greater than in Group A (ordinary methods).

Relation of Food Consumption to Gain in Body Weight.

The relationship between food consumption and gain in body weight is shown in Table 4.

TABLE 4.—RELATIONSHIP OF FOOD CONSUMPTION TO GAIN IN BODY WEIGHT.

Age.	Body Weight per 100 Birds. Group A (Ordinary Methods).	Body Weight per 100 Birds. Group B (Battery System).	*Weight Gain (lb.) per lb. of Food Consumed. Group A (Ordinary Methods).	*Weight Gain (lb.) per lb. of Food Consumed. Group B (Battery System).
	lb.	lb.	lb.	lb.
	White Leghorns.			
1–4 weeks	54·4	50·6	0·303	0·302
5–8 weeks	151·2	143·1	0·277	0·237
9–12 weeks	271·9	284·4	0·232	0·225
13–16 weeks	354·4	360·0	0·143	0·108
1–16 weeks	......	......	0·220	0·180
	Australorps.			
1–4 weeks	46·9	48·1	0·344	0·329
5–8 weeks	148·8	130·6	0·291	0·217
9–12 weeks	291·9	280·6	0·253	0·217
13–16 weeks	413·7	395·0	0·185	0·137
1–16 weeks	......	......	0·240	0·191

* Weight of day-old chickens was taken as 8 lb. per 100.

The greater food consumption of White Leghorns in Group B (battery system) corresponds with a slightly greater body weight gain. Body weight gain per pound of food consumption to 16 weeks was 0.22 lb. for Group A (ordinary methods) as against 0.19 lb. for Group B (battery system).

A Useful Type of Battery Coop.

Food consumption for Australorps was greater in Group B (battery system) and weight gain less than Group A (ordinary methods). Body weight gains per lb. of food consumption to 16 weeks was 0.24 lb. for Group A (ordinary methods) and 0.19 lb. for Group B (battery system).

Comparison of the gain in body weight and amount of food consumed, as shown in Table 4, indicates that disposal at 12 weeks old is likely to be more profitable than disposal at 16 weeks.

Condition of Birds.

During the weighing of the birds at 12 weeks of age cases of breast blisters were noted amongst the Australorps in Group B (battery system). There was no indication of this condition in the White Leghorns in this group at 12 weeks of age, or in either breeds in Group A (ordinary methods). However, at 16 weeks of age approximately 35 per cent. of the White Leghorns and 84 per cent. of Australorps in Group B (battery system) were affected, whilst in

Group A (ordinary methods) only 4.5 per cent. Australorps and no White Leghorns showed this condition.

Back Injuries.

All the birds, both Australorps and White Leghorns, in Group B (battery system) were nervous and took fright at the slightest provocation. This resulted in a large proportion of Australorps being scratched and torn on the back. This condition gradually developed, and was very pronounced between 12 and 16 weeks of age. This trouble was not evident amongst the White Leghorns, which was probably due to the heavier feathering of this breed.

Summary of Results.

In this experiment there was very little difference between the cost of feeding Australorps and White Leghorns, either at 12 or 16 weeks of age, nor was there any appreciable difference in the cost of feeding between the two systems of rearing.

After 12 weeks of age the gain in body weight per lb. of food consumed was greatly reduced in both breeds, and this was more evident in Group B (battery system) than in Group A (ordinary methods), and in White Leghorns than in Australorps in both groups.

The return over cost of feed was about equal for White Leghorns in both systems at both 12 and 16 weeks, but Australorps in Group A (ordinary methods) showed a decided advantage over those in Group B (battery system) at both 12 and 16 weeks.

The high incidence of breast blisters in Group B (battery system) compared with Group A (ordinary methods), was probably due mainly to the nervous condition of the birds, which resulted in injury to the breast bone.

Pullorum-tested Flocks

THE following is a list of flocks which have complied with the Department's Accredited Pullorum-tested Flock Scheme, and which are tested regularly for pullorum disease:—

Name and Address of Owner.	Breeds.
Clucas & Sons, J. E., "Bellevue" Hatchery, Old Northern road, Castle Hill.	Australorps, White Leghorns, Rhode Island Reds.
Hawkesbury Agricultural College, Richmond	White Leghorns, Australorps, Lanshans, Rhode Island Reds, and Turkeys.
Juniel, E., Mrs., Kings-road, Ingleburn	White Leghorns, Australorps.
Kennedy, F. J., "Kenwood," Orchard-avenue, Model Farms.	Australorps, White Leghorns.
Phippard, H. L., Bobbin Head road, Turramurra.	Rhode Island Reds, White Leghorns.
Seven Hills Poultry Experiment Farm, Seven Hills.	Australorps, White Leghorns, Chinese Langshans.
Wagga Agricultural College and Experiment Station, Bomen.	Australorps, White Leghorns.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Quarantine Lifted from Wollongbar Herd.

THE quarantine restrictions on the Wollongbar Experiment Farm herd of stud Guernseys have been lifted, with the result that normal sales of cattle from this Farm can now be resumed.

These restrictions were imposed last December, following the death from Johne's disease of the Department's imported Guernsey bull, "Flare's 2nd of the Bouillon."

During the period of quarantine quite a number of bulls have advanced to serviceable age—and these, together with younger stock, are now available for immediate sale.

For further information, contact the Manager, Wollongbar Experiment Farm, Lismore, N.S.W.

Tubercle-free Herds

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm	63	11/7/50
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jersey and Friesians)	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	90	15/7/50
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	113	23/5/49
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50
Perry, E. L., Shane's Road, via St. Mary's (Jerseys)	67	31/5/50
Police Boys' Club, Camp Mackay, Kurrajong (Jersey and A.I.S.)	26	1/7/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus)	35	23/8/49
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	25/7/51
Scott, A. W. "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	42	30/5/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	165	1/7/51
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	64	21/5/50
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Australian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Barnardo Farm School, Mowbray Park	48	15/7/50
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colley, A. G., "Heatherbrae," Swanbrook Road, Inverell	30	28/7/51
Coote, B. N., Auburn Vale Road, Inverell	38	28/7/51
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	13	6/6/50
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell	111	9/9/49
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	18	31/5/50
Grant, W. S., "Monkittee," Braidwood	20	2/7/50
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	53	1/6/51
Hart, K. H., Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	71	28/7/50
Koyong School, Moss Vale	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	45	8/7/51
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, Estate E., "Bannockburn Station," Inverell	64	8/7/50
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B., "Mount View," Cessnock	67	21/5/49
Marist Bros. College, Campbelltown	70	18/2/50
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	28	15/12/49
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Rolfe, A. E., "Avon Dale," Inverell	23	8/7/50
Rolfe, C. D., "Rose Farm," Inverell	31	17/3/50
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	10	4/7/51
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead	30	9/7/49
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree	60	1/4/50
Tanner, F. C., Dural Rd., Armidale	42	/10/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., "Spring Hills," Camden	61	7/12/49
Waddell, W., "Afton," Oakwood Rd., Inverell	125	8/7/50
Waters, A., Marsh Street, Armidale... ...	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	52	8/11/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, "Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Two Arab Studs to be Established at Wagga Agricultural College and Yanco Experiment Farm.

AN Arab horse stud is to be established at Wagga Agricultural College, headed by the Arab stallion "Sala." Making this announcement, the Minister for Agriculture (Hon. E. H. Graham, M.L.A.) said that "Sala," who, in addition to having an imposing overseas record, won the Arabs' Championship at the 1949 Sydney Royal Easter Show, is regarded as one of the best Arab stallions it was possible to procure in the United Kingdom. The stallion was purchased by the New South Wales Government so that the Arab breed may be given all the assistance possible.

Mr. Graham has also arranged for his Department to purchase the complete stud of mares owned by Mr. J. F. Jelbart, of Stoney Park East, via Albury. "The Stoney Park East Stud is one of the outstanding Arab studs in Australia and represents the life work of a keen horse breeder. These mares, with 'Sala,' will enable establishment of the Wagga College Arab Stud," said Mr. Graham.

The services of the Arab stallion "Sala" have already been completely booked out for this season.

Arab Stud Also at Yanco.

A second Arab stud will also be established at the Yanco Experiment Farm, where the stallion "Jedran" is at present standing the season.

A New Use for Old Brooms.

EVEN if a new broom does sweep clean, at a chicken ranch in California, U.S.A., old brooms have been found to clean better when used as foot scrapers—according to an article in a recent issue of the *California Farmer*.

Located at strategic points about the farm, these foot scrapers are made by drilling a hole in a plank for the sawed-off handle of the broom, pushing the handle into the hole—and there you have a foot brusher and cleaner!

EMERGING FROM THE EMERGENCY

The Department of Railways is rapidly emerging from the state of emergency that developed when the general coal strike began last June; its recovery from this severe set back has revealed the remarkable resiliency of its vast organisation.

Already it has been possible to remove some of the regrettable train service restrictions caused by the cessation of coal supplies. As soon as the first open-cut coal was received and additional goods engines were converted to oil burners improvements were made in both metropolitan and country passenger services and in general freight services. Railway travellers and consignors may be assured that this process will continue as the coal supplies increase until all restrictions have been removed.

In addition to its effect upon the ordinary train services the coal strike postponed the inauguration of improved services. This explains the delay in the running of the new air-conditioned daylight express between Sydney and Albury to which reference was made in the July issue of this publication.

S. R. NICHOLAS,
Secretary for Railways.

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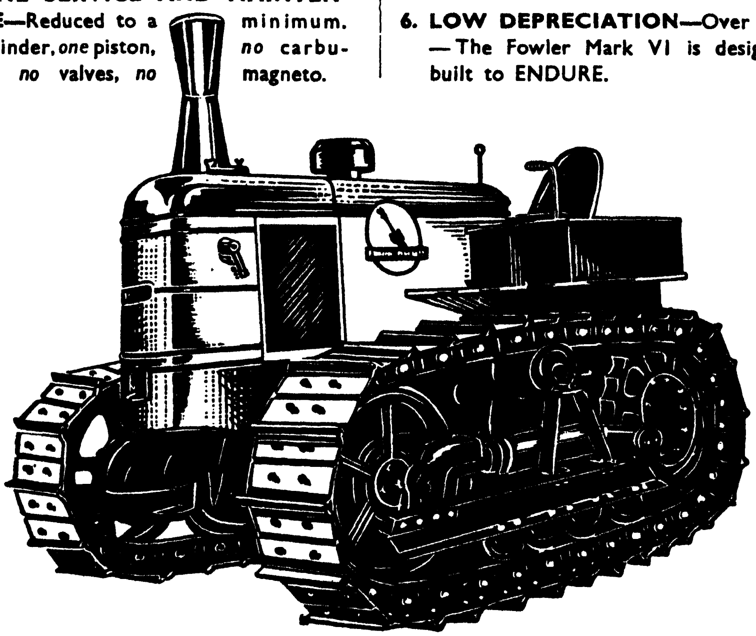

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Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	46
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., " Elwatan," Castle Hill (Jerseys) ...	29
Evans, C. A., & Sons, " Bong Bong," Moss Vale ...	58
Fairbairn & Co., C. P , Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., " Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School,Glenfield (Ayrshires)	69
McEachern, H., " Nundi," Tarcutta (Red Poll)... ...	53
MacPherson, I. F.,"Bloomfield," Yass (Aberdeen-Angus)	39
McSweeney, W. J., " The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., " Yalalunga," Willow-Tree Road, Quirindi (Herefords)	97
Mutton, T., " Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns	102
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87
Reid, D. B., " Evandale," Sutton Forest (Aberdeen-Angus)	52
Reid, G T., " Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., " Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., " Werribee," Waugoola (Aberdeen-Angus)	39
Scott, A. W., " Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., " Gunnawarra," Gulargambone (Beef Shorthorns)	182
Sydney Church of England Grammar School, Moss Vale	43
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
Walker, J. R., " Strathdoon," Wolsley Park	67
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., " Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	71
Yanco Experiment Farm	54
Young, A., " Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Callan Park Mental Hospital	44
Cullen-Ward, A. R., " Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, " Abington," Armidale ...	69
Freudenstein, W. G. A & F. J., "Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth ...	27
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	45
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	28
Prison Farm, Emu Plains	127
Royal Prince Alfred Hospi'al, Camperdown, " Yaralla " Herd	94
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Von Nida, F. E., "Strathgarve," Wildes Meadow, via Moss Vale	32

W. L. HINDMARSH, Chief, Division of Animal Industry.

Points in Introducing Queen Bees—*continued from page 492.*

special safe-like structure is used at the Department. This facilitates the work where a good number of queen bees need to be transferred, and the risk of a flighty queen being troublesome to catch, as may possibly occur if she was released on a window with a large surface, is avoided.

Any beekeeper who transfers a fair number of queen bees received by mail for introduction by other means than the mailing cage method, will find it worthwhile to have one of these catching safes on hand.

The safe is very simple to construct. It is 2 feet 6 inches high, 1 foot in depth, by 1 foot wide. It has a full length hinged and clasped door in front, and a full glass back. The sides and door, apart from the framework, consist of cheesecloth, and the floor is of board. When set up on a windowsill, or on a stand or table near a window, with the glass of the cage facing the window there is ample light, and the catching of the queen, and any imported escort bees as required for examination, can be carried out without anxiety.

PIGS without adequate shelter are susceptible to infections and thus more readily succumb to pneumonia, pig paratyphoid, swine erisipelas and various joint affections.

The faults commonly present are: (1) Insufficient shelter and draughty housing, (2) damp flooring, (3) badly-drained yards and pastures, (4) over-heating through crowding in small sties, and subsequent chill.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Road, Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Draper, R. E., " Glengar," Capertee.
" Endeavour " Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., " Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Police Boys' Club, Camp Mackay, Kurrajong.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Skarratt, A. C., Riverstone.
Wagga Agriculture College and Experiment Station.
Walker, J. R., " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Botulism Can Kill!

Watch Those Home-preserved Foods.

BOTULISM is a rare but serious form of food poisoning with a high death rate—out of every three cases, probably two will die, warns a leaflet issued by the New South Wales State Nutrition Committee, Department of Health.

Botulism, it is stated, may be caused by eating home-preserved vegetables, meat, poultry or fish. Spores or germs of botulism may be present in any of these foods, and if they are not destroyed they produce a toxin (a poison) which develops after the food has been bottled or canned.

The spores of botulism must be destroyed before the food is preserved; this can only be done if the food is bottled or canned at a temperature higher than that of boiling water. This high temperature is reached in large pressure cookers suitable for bottling or in commercial canning processes, but it cannot be reached in ordinary methods of home bottling.

Fruits, tomatoes and rhubarb are safe because the toxin of botulism cannot develop in acid foods. Drying and salting of vegetables are also safe methods.

Except in these cases it is not safe to preserve food at home unless you use a pressure cooker. It is dangerous even to taste the contents of a jar of home-preserved food unless these necessary precautions have been taken. This makes home preserving of vegetables, meat, poultry or fish a continuous risk because the toxin of botulism does not alter the taste or the appearance of food.

Keep in mind that the only safe methods of preserving vegetables, meat, poultry or fish at home are by canning or bottling in a suitable pressure cooker, or by drying, or by salting.

Home preserved foods can be made safe by removing them from the jar and boiling in a saucepan for twenty minutes. Nevertheless, home bottling of vegetables, meat, poultry or fish is not recommended, because they may be eaten by a person who is not aware of the need for this precaution. Moreover, boiling for twenty minutes destroys both flavour and vitamins, especially in vegetables.

THE AGRICULTURAL GAZETTE FOR OCTOBER, 1949

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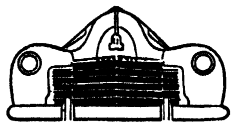

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Rust Disease

Costs World £100 Million a Year

WORLD losses caused by cereal rusts amount to £100,000,000 each year. In New South Wales alone, in 1947-48, wheatgrowers lost £7,000,000 as a result of rust infection.

These figures are taken from the 1949 Farrer Memorial Oration by Professor W. L. Waterhouse, Research Professor in Agriculture at Sydney University.

We use the figures here to emphasise once more the gigantic task being undertaken by agricultural research workers on behalf of primary producers. The achievements of plant breeders in combating rust in wheat are but typical of the achievements of other research workers in numerous other fields, all emphasising the wisdom of expenditure on research.

A Challenge to Breeders.

To reduce still further the huge losses from rust—already they have been reduced considerably—offers a real challenge to plant breeders.

In Australia there are two quite distinct fungal parasites, one causing stem rust, the other leaf rust. A third fungus, common in Europe and in America, is not found here.

Leaf rust occurs early in the season, and its effect upon the leaves is to reduce the number of grains set in an ear, and not so much a shrivelling of the grain as is the case in stem rust attack. Nevertheless, the damage it does is greater than is usually recognised.

Stem rust is the disease of greater importance in Australia. It is caused by a fungus different from that which is responsible for leaf rust and it has a very complex life history, producing five different kinds of spores, and living during one phase of its existence on a shrub, the barberry, when conditions are favourable. In Europe and America its persistence through the winter is dependent upon this stage. Although this phase is rare in Australia, it is very important because new physiological races of the fungus originate in it. Our mild and varied climatic conditions enable the organism to persist in the red spore stage on wheat and grasses without the spore development on the barberry.

Although the life history is simplified here, the fungus demands the closest study. Research has shown that like all living things, this fungus is subject to change, and it is this fact that makes the problem of breeding resistant varieties so complex.

The changes that occur cannot be determined by microscopic means, but require plant-house studies in which each collection

Linlithgow Library.

of rust is tested on a special series of wheat varieties grown in pots and given the most favourable conditions for rust development. Some varieties in this chosen set are found to be resistant, others susceptible. These results are recorded and used to determine what that particular rust really is. The next collection tested may show quite different reactions on these chosen varieties. For example, one that was resistant to the first collection now proves to be susceptible: one that was susceptible is now resistant. Therefore, the two collections are not the same, but consist of two different physiologic races of the fungus. *By such tests, wheat rust has been shown to be not a simple fungus but to comprise more than 200 physiologic races.*

It is the occurrence of different physiologic races that makes the control problem so difficult. It will be remembered that when the variety Eureka was made available, it was not only an excellent agronomic variety, but it was completely resistant to stem rust. In 1941, some rusted plants were sent to the University for study by Mr. J. A. O'Reilly, who collected them at Narrabri. The tests showed that a new physiologic race capable of attacking Eureka had turned up. Next year it was found to be widespread, and now is established in all the Australian wheat-growing areas. In the 1947 epidemic Eureka was completely ruined. This was not due to a change in the weather conditions. Nor was it caused by any change in Eureka: when tested with the original rust it is still quite resistant. The change was in the attacking fungus: it was a new physiologic race.

Last year another quite different race was found in Southern Queensland attacking "Yalta" which has previously been quite resistant. It is likely to prove a virulent and important race, and is calling for a special breeding programme.

It is quite impossible to predict whether a change in physiologic races will occur, or when. The only sound basis for dealing with the problem is constantly to make tests with the rust collections to determine what race is actually present. Such rust surveys have been in progress since 1921, and to date over 9,600 rusts on different cereals and grasses from all parts of Australia and New Zealand have been examined and the physiologic races present determined. Work of this kind, although tedious and time-consuming, must be continued year after year.

When a particular race is found, its capacity to attack commercial varieties and all sorts of wheats can be studied. As each new race turns up, its particular capacities are determined. Varieties formerly resistant may now prove to be susceptible, others may be found to have the double resistance, and thus be valuable as parents in breeding work. As another race arises, a further search for resistance must be made. Field tests are carried out all the time to check the plant-house results. It can be seen that this method means that breeding is based on sure knowledge of the resistance present in the parent, and is not a hit-or-miss attempt to obtain resistant sorts.

The "Progressive Farmers" Report.

THE Rural Bank of New South Wales, which last year sponsored a world tour by a team of "Progressive Farmers" in the interests of Australian agriculture, has issued a series of reports recording the experiences of the team. The booklets fulfil what is perhaps the most important objective of the tour—to pass on to farmers and other interested institutions and individuals the information and experience gained by the team.

Much was seen and learned which the members of the team felt would be of practical interest and value to farmers in this State, and the widest possible spreading of this data is their earnest desire. The improvement of farming methods and conditions was the basic purpose of tours such as this, and their justification is to be found in the success achieved in bringing back new ideas, new techniques, new approaches to common problems which will contribute to the greater efficiency of farming, and the greater welfare of farmers in this country.

The series of booklets comprises "Getting Acquainted"—which is a general account of the team's experiences and impressions—and supplementary reports dealing with "Mixed Farming," "Dairy Farming," "Poultry Farming" and "Government and Agriculture" by the respective members of the team. The latter give more specific and detailed information about the subjects and problems studied and discussed by the teams in countries visited; they are available on application to the Rural Bank.

Official Opening of

WAGGA AGRICULTURAL COLLEGE and Experiment Station

OFFICIALLY opening the Wagga Agricultural College and Experiment Station on 16th September, Hon. E. H. Graham, M.L.A., Minister for Agriculture, said the ambitious plans in hand for Wagga College would make it one of the best in Australia. He hoped that in a few years W.D.A. (Wagga Diploma in Agriculture) would be as widely and as favourably known as H.D.A. (Hawkesbury Diploma in Agriculture).

Cr. R. McCormick, President of the Mitchell Shire, presided over the gathering which numbered approximately 300 including parents of students and officials of local bodies, Education Department and the Department of Agriculture as well as farmers and graziers from surrounding districts.

Among those on the platform were Professor McMillan, Dean of the Faculty of Agriculture, Sydney University; Dr. R. J. Noble; Under Secretary and Director; Alderman Barrand, Mayor of Wagga; Cr. O'Brien, President of Kyeamba Shire; Mr. R. J. Hurst; Mr. Evans, Area Director of Education; Mr. W. Poggendorf, Chief Division of Plant Industry, Mr. Blakemore, Principal of Wagga Teachers' College; Mr. Mason, Principal of Wagga High School; Dr. H. J. Hynes, Assistant Director of Agriculture, and Mr. F. H. Burns, Town Clerk of Wagga.

A General View of the College Shrubbery and Administrative Block.
Taken during the official opening.

Cr. McCormick welcomed the visitors and congratulated the Minister on extending the opportunities for young men to be trained in agriculture to the benefit of the country. As Wagga Experiment Farm, the institution had already given great service to the primary industries, he said.

The Principal's Address.

The College Principal, Mr. B. Doman, B.Sc.Agr., H.D.A., said he was pleased that Mr. Graham was able to be present at the opening of the College. All wished Mr. Graham a speedy recovery to health and return to office.

Hon. E. H. Graham, M.L.A., Minister for Agriculture, speaking at the Opening Ceremony.

Mr. Doman stressed three points in his address to the gathering, viz.: The importance and need for agricultural colleges in general; the significance and potentialities of the Wagga College in particular; and the work of the people who had assisted Wagga Agricultural College since its inception. He said that primary producers suffered certain disadvantages in comparison with those engaged in secondary industries. Potential primary producers did not have the facilities for training that their counterparts in secondary industries had.

There was a great need for more agricultural education in New South Wales. At present there were 126 technical colleges, but only seven agricultural colleges in the Commonwealth. More than 50,000 persons were attending technical colleges, and a further 11,000 were taking technical college correspondence courses, whereas only 250 students were enrolled at Hawkesbury and Wagga Agricultural Colleges.

The agricultural colleges provided a four-year course and were residential. The students were aged between sixteen and twenty years and in addition to agriculture were taught co-operation, leadership, and citizenship. Admittance to the Wagga College was, at the moment restricted to sixty students. This was not a permanent restriction, and in time more would be taken.

Many people and organizations had assisted the College in its first few months, said Mr. Doman, and their help was appreciated. The College was not yet nearly fully equipped. No prize fund had been opened, but several people had contributed.

In conclusion, Mr. Doman said the students as a body had shown the pioneer spirit and, despite the lack of facilities, were doing everything they could to see that the College functioned properly. They were forming great traditions.

Mr. Graham Opens the College.

Mr. Graham, in his address, said he felt sure that the building of an agricultural college at Wagga—one of the best and most diversified districts in the State—was for the benefit of all concerned in agriculture in the Commonwealth. Training and education in agriculture was just as important as it was in secondary industry. Hawkesbury College was booked out for years and something had to be done. When he had found that the training facilities were not available he had made efforts to set up the

The College Principal, Mr. B. Doman, Addressing the Gathering.

Wagga Experiment Farm as an Agricultural College. He was determined that facilities would be made available to sons of farmers and others who wanted to take agriculture as a calling and profession.

The Wagga Experiment Farm had, in the past, done splendid work in research and plant breeding. The famous William Farrer had been closely associated with the Farm. Present at the gathering, said Mr. Graham, was Mr. Robert Hurst, now 82 years of age, who had been field assistant to Farrer. A tribute was paid to Mr. Hurst for the work he had done for the State. The Principal, Mr. Doman, said Mr. Graham, was a man of outstanding technical, practical and administrative training, and the people of Wagga and district should assist and co-operate with him.

The N.S.W. Wheat Research Institute to be established at the Wagga College, for which a contract had been let, would cost £52,000. Plans were being prepared for an administrative block at the College which would house offices and science laboratories and these would cost £40,000. "This is an ambitious plan, but it will make Wagga Agricultural College one of the best in Australia—and the world," Mr. Graham said.

A valuable collection of stud stock was assembled at the College.

Mr. Graham said the College presented a great opportunity to the present pioneer students and those who would follow them. As Minister for Agriculture he would do all he could to help agricultural education. He had the help of officers of the Department of Agriculture and the sympathetic backing of the N.S.W. Government. The Minister said he hoped that bursaries would be forthcoming. The Government was doing its part; the fees charged would not cover one-quarter of the cost of maintaining a student at the College.

After telling present students that he hoped that the Wagga Diploma in Agriculture would be sufficient to carry them wherever they wanted to go in agriculture, Mr. Graham declared the College officially opened and unveiled a tablet commemorating the ceremony.

(*Continued on page* 516.)

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Albury (A. G. Young) .... October 11, 12, 13
Kyogle .... October 12, 13
Lismore (North Coast National) October 19, 20, 21, 22
Alstonville .... October 27, 28
Murwillumbah .... November 2, 3
Mullumbimby .... November 9, 10
Bangalow .... November 16, 17
Nimbin .... November 24, 25

1950.

Lithgow (S. J. Williams) .... February 3, 4
Paterson (S. M. Reynolds) .. February 9, 10, 11
Pambula .... February 10, 11
Candelo .... February 17, 18
Cobargo .... February 22, 23
Newcastle (P. G. Legoe) February 22, 23, 24, 25
Dorrigo (H. S. Doust) .... February 24, 25
Bega (J. Appleby) .... March 2, 3, 4
Delegate .... March 8, 9
Gundagai (J. C. Sattler) .... March 14, 15
Bombala .... March 15, 16
Coonabarabran (M. J. Hennessy) .. March 16, 17
Cooma .... March 21, 22 (or 22, 23)
Dungog (M. Riordan) .... March 24, 25
Moruya .... March 24, 25
Bulahdelah (C. Wilson) .... March 31, April 1
Kempsey (Central North Coast National) (L. H. Riggs) .... April 20, 21, 22
Urbenville (S. Stoddart) .... April 21, 22

Approved Vegetable Seed, October, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear the number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

Varieties Listed.

Cauliflower—

Phenomenal Five Months (E.S. 46/2)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—

All Year Round (E.S. 47/10)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (A.F. 48/3)—Ace Farm Supplies Pty. Ltd., Dee Why parade, Dee Why.

Shorts (E.S. 47/13)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (H.B. 49/5)—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Rouge de Marmande (H.R. 49/1)—H. P. Richards, "Sovereignton," Tenterfield.

Red Cloud (H.R. 49/2)—H. P. Richards, "Sovereignton," Tenterfield.

Marglobe (H.R. 49/3)—H. P. Richards, "Sovereignton," Tenterfield.

Break o' Day (H.R. 49/4)—H. P. Richards, "Sovereignton," Tenterfield.

THE *Agricultural Gazette* is available free and post free to any bona-fide primary producer in possession of a holding in New South Wales.

In order that distribution may be efficient, any farmer who changes his address should notify the Department immediately, and where a producer ceases to be engaged in farming activities, the Department should be informed at once in order to avoid any waste of copies.

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Early White Bush Scalloped Squash	1/6	4/8	14/10	14/6
PUMPKIN—				
Queensland Blue	1/4	3/9	11/6	11/-
ROCKMELON—				
Hales Best P.M.R. 45	1/6	5/-	15/-	14/6
Pride of Wisconsin (Recent variety)	1/8	5/4	16/-	15/6
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Hawkesbury Wilt Resisting	1/6	4/9	14/6	14/-
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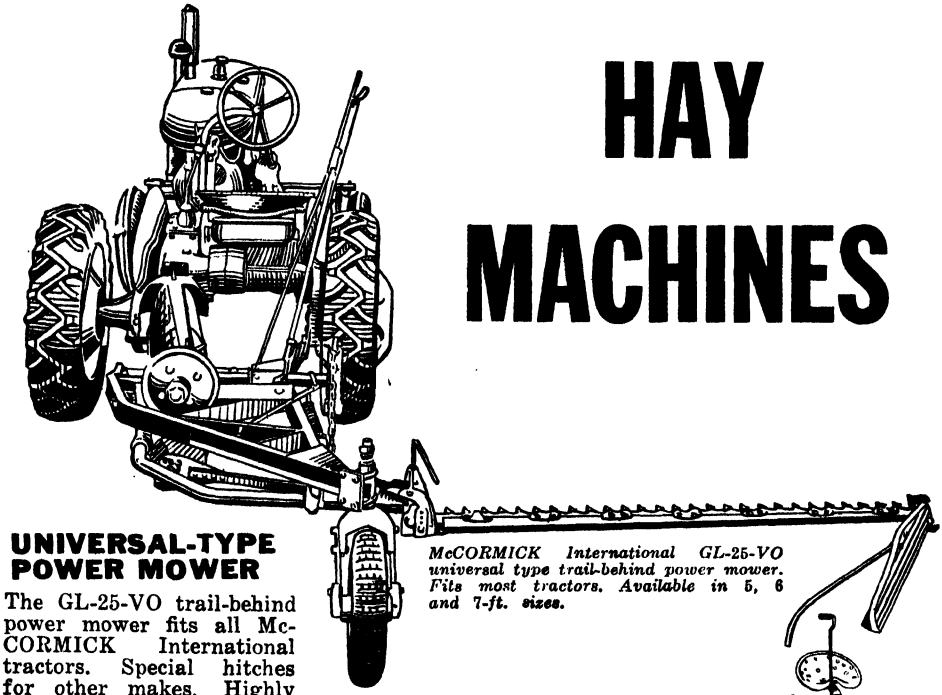

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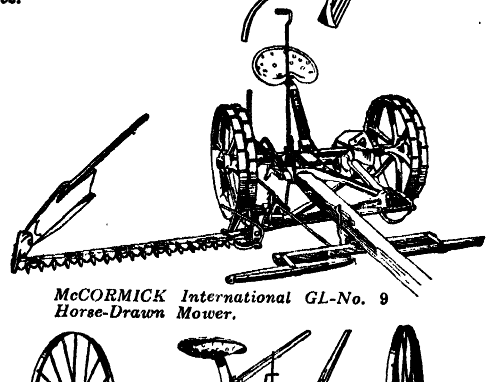

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The Provision of—

FODDER FOR STOCK

—In the Orange, Bathurst and Molong Districts—

(*Concluded from page* 458.)

R. C. MADSEN, H.D.A., District Agronomist.

CONSERVATION of fodder for use in times of drought and of temporary shortage—dealt with by Mr. Madsen in this instalment of his article—is an essential part of a fodder provision programme.

The purpose of the article is to indicate to farmers and graziers of these areas, the methods by which they may utilise their pastures and crops so as to obtain maximum production from their stock throughout the year, and at the same time maintain the fertility of their soils.

Previous instalments in July, August and September issues have dealt with management, pastures and fodder crops.

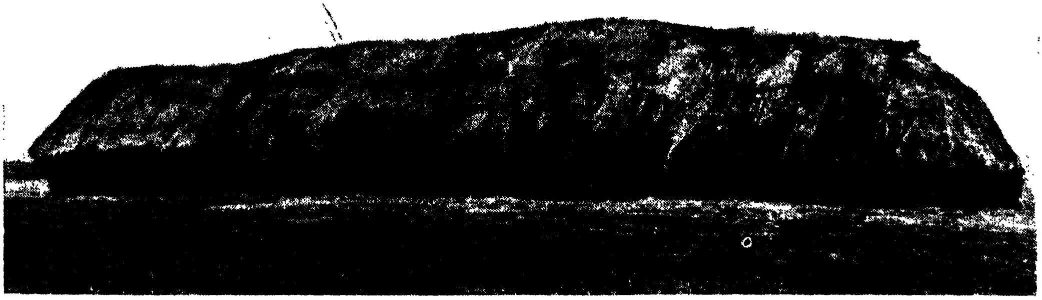
CONSERVED FODDER.

In order to ensure continuity of production, it is essential to have a quantity of conserved fodder—in one or more of the many valuable forms—to carry stock over periods when pastures and crops either partially or completely fail.

Fodder may be conserved in many ways. Some of these are more suitable for the tableland areas than for the slopes—whilst the reverse position may also be experienced. The two principal conserved feeds are hay and grain. Farm size and stock numbers will largely determine the type and quantity of fodder to be conserved but, generally, it is not so important for large quantities to be conserved in the areas of more certain rainfall. Where there are large areas of Subterranean and other clovers, such as on the tablelands, it is essential that a sufficient supply of roughage be on hand to provide the necessary balance in the ration. The greater the extent of pasture improvement the greater the necessity for conserved fodder, for where the carrying capacity of a farm is high, the dry periods are relatively more severe.

Hay.

Meadow Hay.—This is one of the most nutritous types of hay, being of high protein content and superior to cereal hay. Greater use should be made of it. It may be made



A Thatched Stack of Subterranean Clover in the Orange District.

in most seasons on the tablelands, but less frequently on the slopes. It is relished by all stock and there is little wastage. Meadow hay greatly assists in overcoming the dry years and severe winters, and as well, provides the necessary roughage when stock are grazing on young, succulent feed.

In good seasons the growth of grasses and clovers is so profuse on the tablelands that stock cannot keep it down, and much is trampled underfoot and lies in a dense mass on the ground. When dry, it is valuable as a feed for a considerable time, and is especially valuable for sheep.

There is a very close correlation between the areas of pasture cut for hay or silage and the milk produced in the subsequent year. Thus, in a year when a large area is cut in the spring and satisfactorily fed back to cattle the following winter, the production is considerably increased.

No special effort and outlay are required on most farms to harvest pasture hay, which would be wasted if not conserved as hay. If it is valued at the cost of the conservation, it becomes the cheapest of all conserved fodder—perhaps less than half the cost of any other fodder.

Preferably the material should be baled after it has been cut by a mower and raked. In this form, it is easily handled and stored. Often yields of 2 to 4 tons per acre are obtained, but different paddocks should be harvested each year.

Unlike many other forms of conserved fodder, pasture hay is not readily attacked by vermin. It should be stacked on dry foundations under cover, or if stacked in the open, must be well covered.

Harvesting should be carried out when most of the grasses in the sward have come into flower. This is most important in order to preserve the maximum protein content. Correct time to cut pastures that contain a large proportion of clover is decided upon by the growth of the clover, rather than the growth of grass, as the former is slower in developing. Usually the most suitable time is late November or early December on the tablelands and a little earlier on the slopes.

A Pick-up Loader and Power Baler at Work in a Pasture of Clover and Barley Grass.

Lucerne Hay.—Lucerne hay is a very valuable fodder of high protein and mineral content and rich in lime, provided it is harvested in the correct manner and at the correct time. It is relished by all stock, is slightly laxative and, if of good quality, contains far more protein than cereal hay, but a similar amount to meadow and pea vine hay. A high percentage of leaf is necessary (40 to 50 per cent.) and the crop should be free of weeds. However, if the quality is poor, lucerne hay is of little value other than as roughage.

Lucerne is probably the most difficult of all hay crops to cure successfully, and the one most subject to damage and loss through unskilled handling at all stages from

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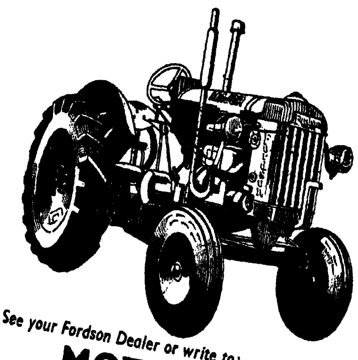

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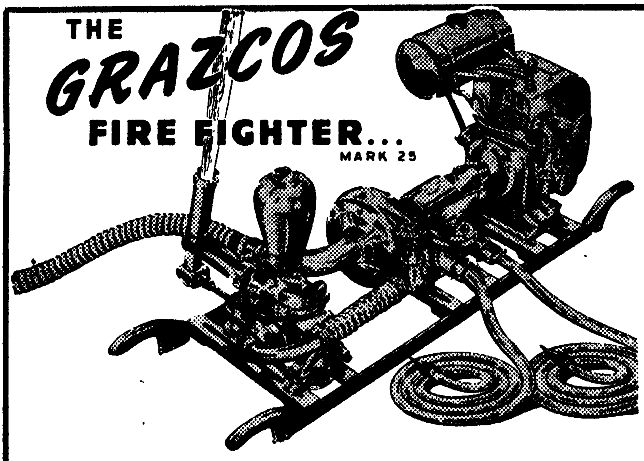

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Consider seed requirements now because types wanted for planting late January to mid March generally have to come from present stocks. Stocks of Phalaris Tuberosa and Mid Season Subterranean Clover are limited and growers would be wise to order early to avoid disappointment and the possible postponement of sowing programmes for twelve months.

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cutting to baling. From 3 to 5 cuts may be made in a season on the slopes, and it is not readily attacked by vermin.

Pea Vine Hay.—The material consists of empty pods and vines. Its feed value is comparable with good lucerne and meadow hay, whilst it is definitely superior to cereal hay or chaff. It is suitable for all stock, but of most value for dairy cattle, especially where protein-poor foods such as oaten and wheaten chaff or cereal grain are being fed. It should be fed after milking owing to tainting.

The vines may be fed when green and fresh but should be spread out in a thin layer to prevent mouldiness which, if present, may cause botulism.

Baled hay is the most desirable form as it is easily handled and stored and there is less waste. In this form also it may be satisfactorily carried over until required during the winter months, provided it is well protected from the weather.

Cereal Hay.

Wheaten and oaten hay are popular forms of conserved fodder for use as roughage. They have an advantage over silage in that they can be easily handled, although bulky.

Crops which have been affected by frosts may be used, but cereal hay should be conserved in its most palatable form, preserving as much as the nutrients of the growing crop as possible. When feeding it should be supplemented by a little grain, grass and clover hay, or lucerne hay.

Wheat for hay should be cut at the flowering stage. Oats are cut when the seed is in the late dough stage, although many prefer to cut for their own use when in the milky stage. The palatability is better in the former case.

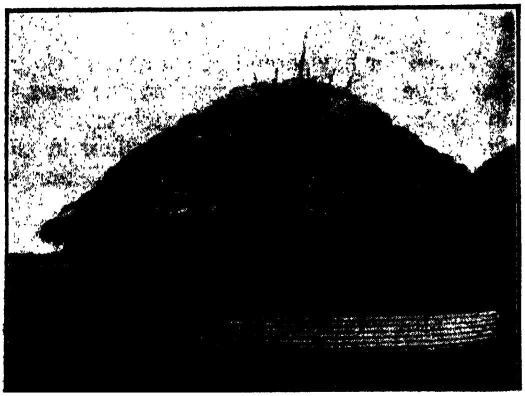
Cereal hay should be baled, if possible, as it is more easily handled and conserved; it is also advisable to store the hay in a suitably constructed shed giving ample protection from weather, fire and vermin. On the other hand, well-constructed and well-shaped stacks are suitable for conserving hay, provided care is taken to prevent damage.

When feeding, it is preferable to chaff in order to minimise loss.

Fresh or Green Pea Vine Residue Being Unloaded for Immediate Feeding to Stock.

Lucerne Chaff.

Lucerne chaff is ideal for dairy cattle but is usually very expensive if not produced on the farm. It is of high protein content, provided it is of good quality. Dusty chaff is to be avoided.



Well-built Cereal Hay Stack, Protected from Mice by a Galvanised Iron Fence.

Cereal Straw.

The nutritive qualities of straw do not compare with those of hay, but it has some value as roughage, especially if the bales are damped with molasses and water (sprinkled if stored as chaff). Treated in this way it is readily eaten by stock, but must be fed with some grain.

Grains.

The feeding of grain is carried out extensively during dry periods or periods of shortage. The system has many advantages, possibly the most important being the concentrated form and ease of handling of the grain and the small waste. Care should be taken to see that the grain is protected from vermin and weevil attack.

Grain alone is not a good fodder—roughage must also be fed.

Oats.—Oat grain is a well-balanced fodder, ideal for most stock, but it is not usually fed to pigs, partly on account of the high fibre content and partly because other foods give as good or better results. Satisfactory results have been achieved where ground oats have been used.

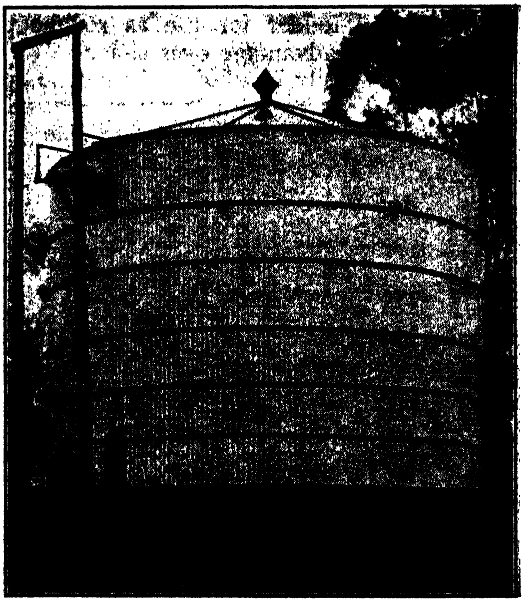
Oats may be stored in iron silos of 1,000 to 1,500 bushels capacity, and may be kept for years, thus being available when required. Oats are less liable to weevil attack than wheat.

Wheat.—Feeding of wheat grain to sheep is carried out extensively during dry periods, particularly on the slopes. This grain is easy to handle, but should be supplemented by roughage, *e.g.*, lucerne chaff or its equivalent.

Wheat is inclined to become pasty on chewing, and is dangerous if fed in excess. Digestive trouble may be experienced with horses if not brought on to the feed gradually. It is little used in New South Wales for cattle feeding, but American experiments indicate that it is equal to maize for milk production when some protein-rich feed, *e.g.*, linseed or peanut meal, is added; it should, however, be coarsely crushed and thoroughly mixed with roughage.

Wheat grain is very suitable for pigs, being equal to maize in fattening quality. As a feed for sheep, especially in times of drought, it is a valuable concentrate.

It is not necessary to soak wheat before feeding, and no serious ill effects from feeding sheep with dusted wheat have been reported.



Galvanised Iron Grain Silo.

Wheat silos are extensively used for storing and the grain should be treated periodically for weevils.

Grain Sorghum.—Grain sorghums are grown to a limited extent only. They may be grazed off in the paddock, but it is not

advisable to do so until the crop comes into head, owing to possible prussic acid poisoning.

It is preferable to harvest the grain and then feed to stock. The food value is high—approximately the same as maize. The grain is suitable as a supplementary or drought fodder for all classes of stock, but should be coarsely crushed or rolled before feeding to cattle or horses. Animals should be brought on to this grain gradually, using small quantities for a start with a gradual increase. It is best fed with some bulky feed as chaff or silage, or bulky concentrate, as crushed oats or bran.

Sowing on the slopes should be in October or November at the rate of 4 to 6 lb. per acre through every fourth run of the drill or combine, or through every second run at 8 to 10 lb. per acre, with 1 cwt. of superphosphate. The seed should be treated with copper carbonate or ceresan (2 ozs. per bushel) for kernel smut.

The recommended varieties are:—Kalo, Hegari, Wheatland, Caprock.

Barley.—This grain is suitable for pigs only and should be crushed before feeding. The awns on the grain make it unsuitable for feeding to other classes of stock, unless ground.

Field Peas.—Field peas are of high feed value, but perhaps a little expensive to grow and, unless favourable seasonal conditions are experienced, the returns may not be profitable. It is preferable to harvest the peas, and crack the grain before feeding.

They should be sown only on the Central Slopes, in May and June, at the rate of 1 bushel, with 1 cwt. of superphosphate per acre.

Recommended varieties are White Brunswick and Early Dun.

Silage.

Silage making is a process whereby succulent feed may be preserved, with a minimum loss of digestive food material, for years or for a period of a few weeks. The conservation of fodder as silage has much to commend it. In many instances the palatability of grass feed is improved, while the digestibility of some constituents may be increased. Silage may be made successfully under practically all weather conditions and from crops unsuitable for hay making.

Silage making allows a surplus of feed to be conserved fairly cheaply for use in times of shortage; it may be conserved in various ways, namely, pit, tub or stack. Silage is not subject to damage by fire or mice, while, generally speaking, rain causes no damage to it provided reasonable care is given in the selection of the site and processing of the material. There is less risk of loss than in the case of hay making.

A Trench Type Pit Silo Ready for Filling.

Silage has a definite although restricted place in a fodder conservation programme, being useful primarily as a drought feed in association with stored hay or grain, and as a supplementary ration for milking or breeding stock when there is a shortage of succulent pasturage or only dry feed is available. Silage making is a comparatively cheap process, but cutting the material out of a pit is costly and laborious.

The following crops can be utilised for silage.

(*a*) Pea vines, if not made into hay or fed direct in the paddock whilst fresh.

(*b*) First cut lucerne hay which contains barley grass, etc.

(*c*) Japanese millet, cut when the seeds begin to fill.

(*d*) Winter cereals (wheat, oats and barley), cut at the early flowering stage.

(*e*) Rye; suitable, but may be better fed as grain feed.

(*f*) Maize, cut when the cobs are well formed and grain is filling but before frosting.

(*g*) Sweet sorghum, cut when the grain has formed and hardened, but before the plant commences to dry off.

Official Opening of Wagga Agricultural College—*continued from page 509.*

Prizes Donated.

Superintendent W. R. Lawrence, of the N.S.W. Police Force, and the father of a student, donated a £10 10s. 0d. prize to the student showing greatest proficiency in sheep and wool each year, and on behalf of students of Hawkesbury Agricultural College, Student Chambers, President of the Students' Representative Council at Hawkesbury, presented a trophy to Wagga students, which was accepted by Student Wearne, of Wagga College.

Trees Planted.

Trees to commemorate the occasion were planted by Hon. E. H. Graham, Ald. Barrand, Cr. McCormick, Cr. A. O'Brien (President of Kyeamba Shire) and Mr. R. J. Hurst.

Afternoon tea was served in the shrubbery fronting the College and visitors were later taken on conducted tours of the various sections.

Production of Castor Beans.

Promising Results on M.I.A.

PROMISING results have been obtained in tests carried out in mechanical harvesting of certain varieties of castor beans on the Murrumbidgee Irrigation Area, where irrigation and harvesting machinery are readily available.

The results of a trial carried out at Yanco Experiment Farm during 1948-49 have been sufficiently promising to conclude that the dwarf varieties of castor beans are suited to mechanical harvesting by the header, provided certain minor adjustments are made to the machine.

It has also been found that the rows should be only 2 feet apart and the seed approximately 2 to 4 inches apart in the rows; up to the present, castor beans have usually been planted in rows 3 to 4 feet apart, and the seed 2 to 3 inches apart in the rows.

The tests indicate that yields under Australian conditions will compare very favourably with those of the main producing countries (India, China, South America, Mexico, Egypt), and will be in the vicinity of 1,000 lb. to the acre.

In 1948, seed of a small quantity of Mauthner's Dwarf was introduced from South Africa, and this variety appears to be the most promising handled to date. An oil test is now being made, and the variety will be subjected also to a yield test under mechanically harvested conditions at Yanco Experiment Farm this season.

With the introduction of Mauthner's Dwarf variety, and the success obtained by departmental agronomists at Yanco in adapting the header for harvesting castor plants, it should be possible very soon to recommend this crop to farmers in areas suitable for its cultivation. Australia should then be growing her own castor oil requirements for which there is at present a profitable market.—W. M. CURTEIS, Special Agronomist.

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Trace Elements (by Dr. E. Pfeiffer, a distinguished scientist and world authority on this subject)
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Population Pressure—A World Danger
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BUSINESS OF FARMING

Notes Prepared by the Division of Marketing and Agricultural Economics

Some Facts and Current Problems of THE POTATO INDUSTRY*

THE potato has now become an indispensable article of diet in most countries where it can be successfully grown. Recurrent shortages in the last few seasons in New South Wales have served to highlight attention upon the problems involved in the production and marketing of this crop.

The history of the potato is interesting. Before the Incas set up their civilisation, potatoes were an established article of food for the natives of South America. In 1542 potatoes were introduced into Spain from Peru, and in 1586 they were brought from Virginia to Ireland by Sir Walter Raleigh and were grown on his estate. In 1663 the Royal Society attempted to popularise the use of potatoes in England, but failed. One hundred and eleven years later, in 1774, Frederick the Great imposed the use of potatoes on the German people, and since then they have been universally grown in European countries.

To-day, potato production exceeds in volume any other food crop in the world, with the exception of wheat and rice. In 1947 Australian consumption of potatoes was 527,600 tons, representing 133.4 lb. per head per annum.

Nutritive Value.

The potato is probably the most economical and valuable vegetable in the low cost diet. It contains appreciable amounts of essential vitamins, and in the Australian diet it contributes approximately one-third of the total anti-scurvy vitamin (ascorbic acid). It is also a good source of calcium and other minerals. The potato is usually consumed whole and with a minimum of preliminary processing, and thus it largely retains its natural components of minerals and vitamins.

In Australia, with its relative abundance of other foodstuffs, per capita consumption of potatoes is naturally not as high as it is in Great Britain and Europe, although remaining a very important foodstuff. Moreover, in Europe before the war, substantial quantities of potatoes were also fed to livestock and used for the manufacture of various by-products.

The world food shortage of World War II and the immediate post-war periods has emphasised the importance of the potato as a food. On both the continent of Europe and in the British Isles this food shortage resulted in a marked extension of the production of cereals and potatoes at the expense of grazing land.

* Compiled from The Australian Potato Industry (Bulletin No. 5 of the Bureau of Agricultural Economics), departmental and other sources.

Production.

Potato cultivation has many advantages which have contributed to its popularity as a foodstuff. These include:—

(*a*) The wide range of soils in which it can be successfully grown.

(*b*) The unspecialised nature of the equipment needed for soil preparation, planting, cultivation and harvesting. (For example, it can be grown as a backyard crop.)

(*c*) Production can be easily expanded or reduced.

(*d*) The potato can be comparatively easily stored.

(*e*) It requires no processing before it can be consumed.

(*f*) It can be eaten in a variety of ways.

On the other hand, cultivation does possess some disadvantages, viz.:—

(1) Hand labour is required in production and harvesting.

(2) The harvested crop is bulky to transport and store, and in some climates deterioration is rapid.

(3) The crop is susceptible to disease.

(4) Repeated cropping rapidly depletes soil fertility.

The potato industry in Australia is characterised by comparatively low yields per acre. For example, in Ireland, 6.4 tons per acre can be obtained; in New Zealand, 5.75 tons; whilst in Australia, 2.73 tons has been the average yield over recent years. Although there has been a slight improvement in average yield per acre in New South Wales, these yields are still below the Commonwealth average. It is of some interest to note that annual production was much higher in this State forty years ago that it is now. For example, the production of 121,033 tons achieved in the year 1911 has not since been equalled or even approached.

War-time Industry Controls

Pre-war, potatoes were subject to the fluctuations of open market conditions. The importance of stabilising the production of potatoes was, however, early recognised by the Commonwealth

Government when during World War II plans had to be made to ensure that the civilian population would not become short of essential foodstuffs, and the growing needs of the armed services had to be met.

In April, 1942, potatoes were brought under control by the National Security (Potatoes) Regulations. These regulations set up an Australian Potato Committee and gave it power to regulate or prohibit the production, supply, distribution, sale or disposal of potatoes. The Potato Committee was given no powers compulsorily to acquire potatoes, although it could purchase them by agreement. Later, in 1942, the Commonwealth in order to increase overall potato and vegetable production, instituted a system whereby contracts were offered to growers. Under contracts so entered into, growers undertook to deliver potatoes upon set terms as and when required by the controlling committee. Later still, in the same year, the Commonwealth Potato Controller completed arrangements whereby merchants and agents were appointed to receive potatoes on behalf of the Commonwealth and to sell them at fixed margins of profit.

In 1943, following requests from the nutrition authorities, and in accordance otherwise with Government policy at the time, a subsidy scheme was evolved for potatoes, and this entailed some alterations in marketing. Under this scheme, practically all growers entered into contracts with the Australian Potato Committee and the growers became entitled to receive fixed prices per ton for first-grade potatoes, irrespective of the price at which they might subsequently be sold. Price controls otherwise regulated retail and wholesale prices. These marketing arrangements applied to the whole of Australia. Broadly, under this subsidy scheme, the grower was given a stable guaranteed price for all potatoes grown under contract. Margins were also fixed at each stage and to meet various distribution and retailing costs. All risks of transport and storage were borne by the Commonwealth and consumers were provided with potatoes at fixed prices which, while varying in different localities, were yet considerably lower than would otherwise have been the case.

The potato controls as introduced and implemented during World War II may be said to have been completely successful in achieving their stated objectives. The expenditure involved, however, was not inconsiderable, the consumer subsidy and various administrative charges amounting to £1,708,000 in the year 1943-44; £2,453,000 (1944-45); £2,826,000 (1945-46); £3,012,000 (1946-47); £2,705,000 (1947-48). Commonwealth controls and the potato subsidy were withdrawn in November, 1948.

Post-war Marketing of Potatoes.

In 1945 and 1946 a number of conferences were held in all States to determine post-war plans for the marketing of potatoes in anticipation of Commonwealth control over the potato industry eventually drawing to a close. There was unanimity in the ranks of growers that some form of planned marketing was desirable in order to retain some of the advantages which had been evident during the war-time years. It was fully recognised that the alternative to the continuance of some form of control was the return to the open market system under which potato growers would independently consign potatoes for sale to agents, thus providing room for speculation and alternation of gluts and scarcities.

In December, 1946, a Potato Marketing Board was constituted in New South Wales under the Marketing of Primary Products Act, and the Board was appointed in April, 1947. At the time the Board was formed, it was anticipated that Commonwealth control over the potato industry would cease at the end of 1947 when it would devolve upon the New South Wales Board to organise a pooled marketing plan to take over from the contract and subsidy scheme of the Commonwealth. The position remained uncertain from April, 1947, until towards the end of the year, when the Commonwealth Government announced that it would continue potato controls for a further period of twelve months. The New South Wales Board functioned in the meantime as an Advisory Committee and did not assume its internal marketing responsibilities until October, 1948. It is now functioning as an established administrative agency.

At the present time, the overall Australian position is that Potato Marketing Boards have been formed in all States of the Commonwealth, the five mainland States working on a pool basis, only the Tasmanian Board, which had been established many years before, being otherwise organised and fulfilling differentfunctions. Various State Marketing Boards have organised between themselves to form a Commonwealth Co-ordinating Committee which meets from time to time to consider industry problems.

Marketing Problems in New South Wales.

At the present time, the average annual production of potatoes in New South Wales is equivalent to approximately one-third of the annual consumption, which amounts to about 140,000 tons. This is due to the fact that the State is not as climatically suitable as the southern States, Victoria and Tasmania, the results being that yields are on the whole lower and the risks attending production much greater. Declining soil fertility in established districts is thought to be a further reason for comparatively low average yields.

Production in New South Wales can be divided on a geographical basis into two groups: (*a*) coastal, and (*b*) tableland. Coastal districts are responsible for early potatoes which are marketed from October until January, whereas the tableland districts produce mid-season and late crops which are marketed, according to the district, from about January to the following September. The main crop is the more important because it can be stored and marketed over an extended period, and it is the one of which greater production is required. The early coastal crop, which is highly perishable, is important in so far as it is marketed when main crop potatoes are unavailable. However, orderly marketing of the early

crop is rendered difficult because of its perishable nature, which is often accentuated by the presence of disease and insect pests, and the fact that the crops are harvested and consequently must be marketed over a relatively short period.

This seasonal production of New South Wales grown potatoes must in all years be supplemented by heavy imports from Victoria and Tasmania. It is at all times important that these imports should be so regulated that they do not flood the market and are timed to fit into the gaps in the local production. This means that as far as possible, the New South Wales Potato Marketing Board must work in close co-operation with importing agencies and with the Boards in the supplying States. A consequence also of building up and maintaining a regular delivery service with a perishable and bulky product is that transport arrangements must be fluid so that potato supplies can be moved quickly when required, particularly from one State to another.

One of the factors which has been responsible for temporary shortages in New South Wales has been transport. This involves shipping from Tasmanian ports to Sydney and rail transport from Victoria to New South Wales, and internally within the State. These difficulties should in time be removed.

In so far as New South Wales production is concerned, the possibility is that in due time there will be increased mechanisation, particularly in tableland districts, in order to offset present-day relatively high production costs. Already harvesters are being used in some districts with varying degrees of success. A further possibility is that both in this State and elsewhere the production of potatoes under irrigation will increase. Dry spells during the spring and summer months are frequently responsible for heavy losses of marketable tubers and cause instability in the industry.

Two other factors, however, are important in assessing the present New South Wales position. The first of these concerns soil fertility. There is some increasing evidence that in potato-growing districts the soils are declining in fertility. This carries with it the need for improved farm practices and the resting of impoverished soils. The second factor is that since potatoes are usually grown on mixed farms, other crops and other types of production are now strongly competing with potatoes because of the relatively high prices now ruling for most forms of primary production. Incentives must, therefore, be offering to encourage a full production of potatoes.

These and other problems are now receiving the attention of the controlling authorities both in this and other States of the Commonwealth.

Are There Too Many Butter Factories ?

MORE than two years ago—in August, 1947—the management of Norco, a co-operative association which produces more butter than any other single proprietary firm or group of co-operatives in New South Wales, decided to hold a ballot among its members to decide whether members were willing to back the announced policy of the management drastically to reduce the number of butter factories under its control and to concentrate production in the larger and more efficient factories. At the time a considerable amount of opposition was encountered, but in spite of this opposition the majority of members of Norco endorsed the stand taken by their elected representatives.

Although the public discussion which preceded the ballot at that time focussed attention on this interesting decision of the Norco management, the number of butter factories in New South Wales has been, in fact, declining steadily ever since statistics regarding the number of butter factories in the State have been compiled. In 1916, for instance, there were 153 butter factories in this State, producing over 55 million pounds of butter, or an average of approximately 360,000 lb. each. By 1920, the 128 butter factories in the State were producing almost 62 millions pounds of butter, or an average of 484,000 lb. per factory. By 1929 the number of butter factories had fallen to 100, and the total production of factory butter in the State exceeded 90 million pounds.

During the depression years the quantity of factory butter produced increased greatly, whilst the number of butter factories remained more or less stable round the 100 mark. During World War II, coupled with a decline in butter production, there was also a considerable decline in the number of butter factories. At the end of the war only 89 factories remained in operation, and on 31st March, 1948, only 74 factories were in use.*

Taking the whole period of more than thirty years, we find that whilst factory butter production rose by about 50 per cent., the number of factories producing butter declined by more than one-half.

Advantages of Larger Factories.

When the factory system originally started in the 'nineties bad roads and slow means of transportation prevented the collection of cream over large distances. As time went on there were many amalgamations and some firms dropped out as means of transport improved.

Larger factories have great advantages over small factories from the point of view of production costs. They can take advantage of new

* For the purpose of this article, the approximate 2 per cent. trend away from deliveries of cream to factories, towards whole-milk deliveries, has been ignored.

developments in large-scale equipment. Whilst small churns produce approximately 100 boxes of butter per day—if they are kept running continuously—large churns, with little more labour, can turn out about 400 boxes a day. Similarly, large factories are able to use mechanical packing methods which increase handling capacity by more than 100 per cent. per man.

Butter Manufacturing Costs in U.S.A.

In 1941-42 costs of manufacture of butter were measured in 168 butter factories of different sizes in Minnesota, U.S.A. According to figures published by the Co-operative Auditing Service Inc., Minneapolis, Minn., costs of manufacture of butter averaged 2.18 cents per lb. for factories producing over 500,000 lb. of butter per annum, and 3.99 cents per lb. for factories with a production of less than 100,000 lb. of butter per annum. Other studies in California showed that the most efficient butter factories, *i.e.*, those with the lowest cost of production, produced between 2½ and 4 million pounds of butter per annum.

New South Wales Figures.

According to figures published by Norco, costs in their largest factories averaged 1.55 pence per lb. of butter, whilst costs in the smaller factories were 2.3 pence per lb. of butter. These differences may not appear very large, but since a reasonably sized dairy farm will produce between 8,000 and 12,000 pounds of butter per annum, the long-term loss to dairy-farmers supplying these smaller factories would amount to approximately 10s. per week. This loss is ultimately borne by the dairy farmers concerned. Whilst dairy-farmers are at present receiving a guaranteed price which is fairly attractive, in the long run improvements in the efficiency of production and marketing of butter will be necessary if butter is to compete successfully on the world market.—F. H. GRUEN, Economics Research Officer.

Wheat Research Institute at Wagga Agricultural College.

Contract Signed.

A CONTRACT has been signed for the construction of the New South Wales Wheat Research Institute at Wagga Agricultural College at a total estimated cost of £52,000.

Making this announcement, the Hon. E. H. Graham, M.L.A., Minister for Agriculture, said, "No doubt the news of an early start on the Wheat Research Institute will be welcomed by millers, bakers, wheatgrowers and, in fact, all concerned with the wheat industry. It certainly gives me great pleasure. Everyone agrees that a great deal of research is necessary into all aspects of wheat-growing with a view to improving not only crop yields but the baking quality of flour. The establishment of the Wheat Research Institute at Wagga Agricultural College and Experiment Station will be an important step forward in our efforts to give better bread to consumers."

Increased Windbreak Plantings in the Hills District.

MANY Hills district orchardists are recognising the error of failing to protect their fruit trees against wind, and have planted windbreaks, reports the Division of Horticulture.

Unfortunately, it takes some time for trees to grow high enough for this purpose, and it is considered that windbreak plantings should be given much higher priority when an orchard is being established.

A Pitt Town grower whose land was suffering from wind erosion to the detriment of both the soil and the young citrus trees has found a partial solution to this problem. In late summer he plants two or three rows of maize between the trees, and leaves the dry stalks standing during the winter and spring.

Protection from severe winds results in better tree growth, better and more fruit. Older orchardists almost invariably recognised the importance of protection by leaving belts of timber intact to shelter their orchard plantings.

More recently the urge to plant every available acre has led to extensive clearing. Sheltered areas have been opened up to the winds—with a subsequent drop in production.

AN opportunity was given on 20th September for senior officers of the Department to meet six delegates who had attended the recent British Commonwealth Scientific Official Conference at Adelaide on "Plant and Animal Nutrition in Relation to Soil and Climatic Factors."

The visiting party comprised Sir Edward Salisbury, Director of the Royal Botanic Garden at Kew; Dr. P. S. Nutman and Dr. P. J. G. Mann, of Rothamstead Agricultural Experiment Station in England; Mr. J. B. E. Patterson, of the British National Advisory Service; Dr. J. Bonner, Professor of Biology at the Californian Institute of Technology; and Dr. K. Hamner, of the University of California, Division of Botany.

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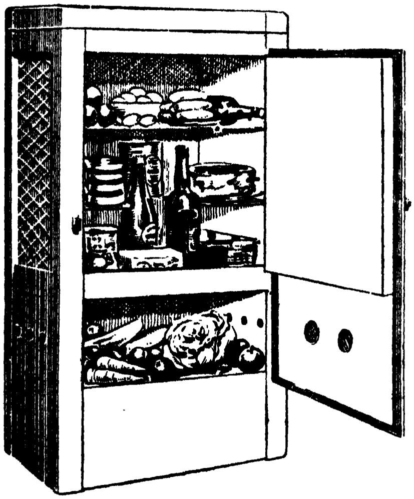

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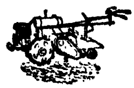

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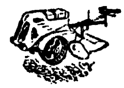

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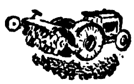

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STUNTING AND SCALY BUTT OF CITRUS
Associated with Poncirus trifoliata Rootstock

R. J. BENTON, Principal Fruit Officer (Extension); F. T. BOWMAN, Ph.D., Special Fruit Research Officer; LILIAN FRASER, D.Sc., Plant Pathologist; R. G. KEBBY, Special Fruit Officer.*

PONCIRUS TRIFOLIATA has been used to a limited extent as a rootstock for citrus in Australia for over fifty years, particularly in the vicinity of Sydney. It has been recognised as conferring certain desirable characteristics on the fruit and on the tree, and at the same time as having one outstanding defect which has caused it to be relegated to a minor role as a rootstock. This disadvantage has been of particular interest, because it has been felt that, if it could be overcome, the advantages of trifoliata stock would perhaps enable it to assume the status of a major rootstock.

The position in New South Wales is that it has been recommended for many years for Valencia orange and the main varieties of mandarins—and also for grapefruit only because of its influence on quality—but it has not been recommended for Washington Navel orange or lemons. On trifoliata, varieties of the latter group are subject to dwarfing or stunting and the stock to a scaling of the bark popularly called "scaly-butt", the percentage of the trees affected and the severity of the symptoms being unpredictable. Nevertheless, groves which consist entirely of vigorous and satisfactory trees of Washington Navel orange on this stock are known, clearly indicating a problem for investigation, the elucidation of which should bring the unreliable bracket of varieties into the same category as Valencia orange as regards suitability to trifoliata stock.

Brief accounts of progress has been published,[2a, 2b] in which a virus cause for scaly butt was shown. The present paper gives an expanded account of the problem and the results of the investigations to date.

MERITS AND DEMERITS.

Resistance to Phytophthora.—

Although the oldest known trees on trifoliata root stock in New South Wales, and indeed in Australia, are now over sixty years of age, the stock was little used at the time when they were propagated, and for many years afterwards. At the beginning of this century, navel oranges were becoming increasingly popular, and it is not unlikely that the unsatisfactory performance of this variety on trifoliata stock was an important factor in discouraging its more general use.

* The three first-named authors were constituted as a Committee in 1943 to investigate the problem reported herein. Mr. Kebby joined the Committee in 1948 on his appointment to the position of Special Fruit Officer (Citrus) formerly occupied by Mr. Benton.

The authors wish to acknowledge the valuable field assistance of Mr. A. C. Arnott, Fruit Inspector, and Mr. E. C. Levitt, Fruit Officer, as well as officers of Narara Nursery who carried out the propagational work. The keen co-operation of Mr. W. Barrett, of Dooralong, Mr. H. V. Braund, Griffith, and many growers and nurserymen, is also gratefully acknowledged.

The potential value of trifoliata was brought to attention about twenty-five years ago by observation (R.J.B.) of the fact that aged Washington Navel trees were able to thrive and bear satisfactorily in locations where the variety on rough lemon was subject to collar rot and foot rot. This was very apparent in the vicinity of Dooralong Creek, Wyong, New South Wales, where citrus is grown on the alluvial flats subject to flooding at irregular intervals.

The principal references to trifoliata in literature on citrus culture at that time were to the general effect that it had been an unsatisfactory stock, except for a very restricted number of varieties, which included Satsuma mandarins. For example, Coit[4] stated that "in California trifoliata is little used. There remain a few old orange and pomelo orchards on it which are doing fairly well but failures are more frequent than

successes . . . Trifoliata is very objectionable for lemon and has been an absolute failure in every case recorded in California."

Hume[15] stated that it was the only stock for high grade Satsumas and was an excellent stock for kumquat, limequat, Duncan pomelo and Calamondin. Marsh grapefruit was a failure on it. Many sweet oranges such as Ruby, Pineapple, Parson Brown, Valencia and Washington Navel made good growth on trifoliata stock.

Davis[6] summarised experiences in South Africa as follows:—"The trifoliata orange has been used as a stock for the kumquat with best results, also for naartje (mandarin) though the growth of the tree on this stock is slow. The fruit produced is, however, of the very best quality. Most late fruiting scions do fairly well, but navels and other varieties which ripen early are very considerably dwarfed by its use." Elsewhere[5] he stated: " . . . All kinds of citrus fruits were budded on this stock. One result was the same in every instance. Grapefruits and lemons, oranges and naartjes grown on trifoliata roots were of finer texture and better flavour than where grown on the original trees. The second effect of the use of this stock was to dwarf every kind of lemon and grapefruit and practically all sweet oranges with the exception of late varieties like Du Roi and Valencia Late. These and most kinds of naartjes were very little dwarfed. The influence of the stock on the quality of the naartjes was especially marked."

Clark Powell[3] had the following interesting comment on trifoliata: ". . . In South Africa . . . it is usually dwarfing in its effect on the scion. This effect is variable in degree, probably due to the existence of several strains of the stock . . ."

Notwithstanding the generally adverse opinions at that time, two factors in the growth of the trees at Dooralong recommended the trial of trifoliata on a large scale, namely, the well-grown vigorous nature of the trees and the resistance of the stock to the effects of floodings and "wet feet." A considerable number of trees was propagated by the Department as well as by nurserymen, and widely distributed in the citrus districts of New South Wales. The results have served to confirm the early observations and to indicate the reaction of a wider range of scion varieties to the root stock[1].

The effects of flooding are important from time to time in several citrus-growing areas in this State. In the coastal districts between Sydney and Wyong, including the Hawkesbury river flats, a good deal of the citrus is grown on low lands or creek and river flats which have a greater depth of soil and better soil moisture conditions in dry

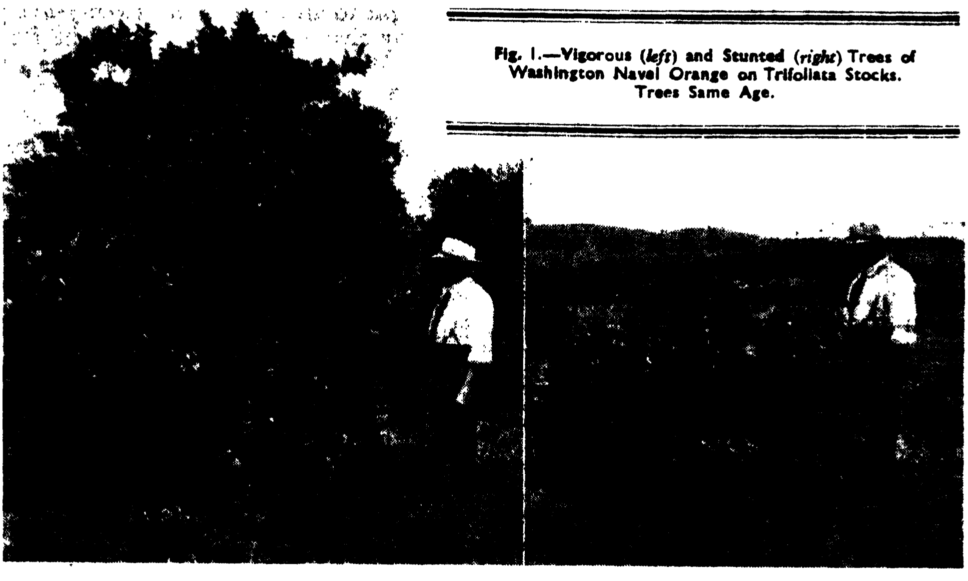

Fig. 1.—Vigorous (*left*) and Stunted (*right*) Trees of Washington Navel Orange on Trifoliata Stocks. Trees Same Age.

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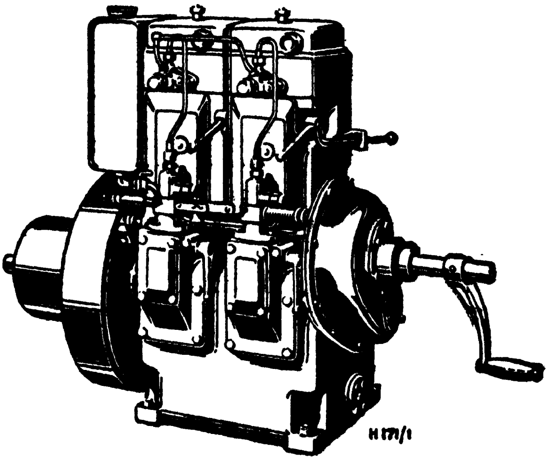

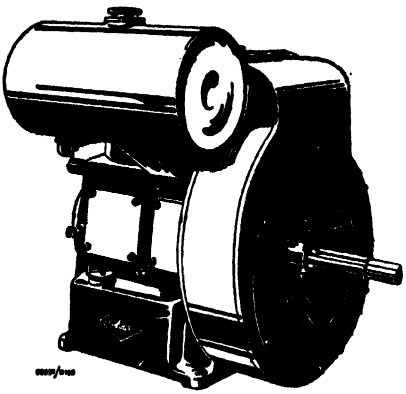

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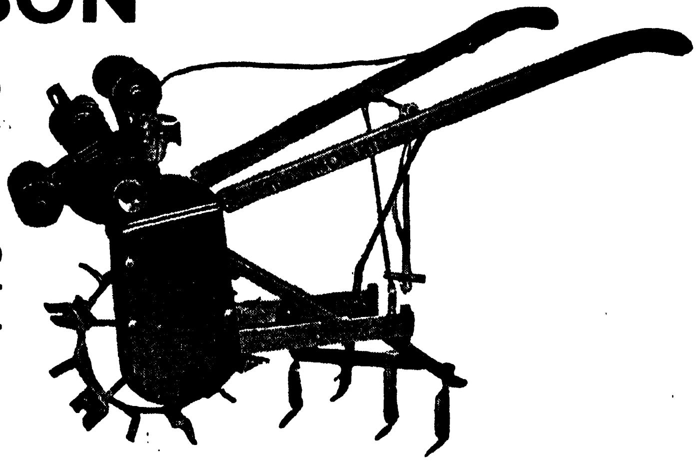

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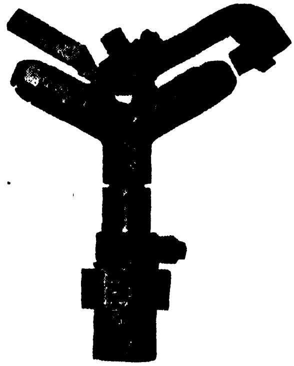

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periods than surrounding hillsides. In extreme cases, citrus is being grown where the ground water stands at some 18 inches

Fig. 2.—The Union of a Vigorous Washington Navel Orange on Trifoliata—Forty-five Years Old.
Note overgrowth and ribbing of the stock.

from the surface, and in situations such as these, trees on trifoliata stock are doing exceptionally well.

The second main citrus area, the Murrumbidgee Irrigation Area, is also subject to occasional flooded conditions which arise, not from the overflowing of creeks, but from abnormally wet winters and the failure of the natural and artificial surface drainage system to cope with the surplus water. Many of the soils are comparatively heavy and shallow, and, in many instances, deficient in natural underground drainage, and they quickly become saturated from excessive rainfall. Such periods of flooding have, in the past, caused serious decline in tree health. The worst incidence of such a decline in recent years was following the wet winters of 1939 and 1942, as a result of which about half the trees of bearing age went out of production, and many younger trees were lost.

It was found that the prevailing root rot was caused by *Phytophthora citrophthora*, and that the fundamental reason for the decline, both in the Murrumbidgee Irrigation Areas and coastal districts, was the active development of this organism under wet soil conditions[10, 11].

Not only is *Phytophthora citrophthora* responsible for deterioration in existing groves, but it renders replanting a difficult problem. Where trees have been removed following decline from root rot, it has proved impossible to re-establish trees on rough lemon stock unless the tree sites were resoiled (Fig. 4). Trees on trifoliata stock, however, planted in infested soil, make very good growth. This is very well illustrated in the Murrumbidgee Irrigation Areas.

Phytophthora root and collar rots are often quite prevalent in citrus nurseries in the Carlingford-Ermington districts in years when an abundant autumn rainfall is re-received or excessive irrigation applied. Following such a season (1945) heavy losses of worked trees on rough lemon root stocks were experienced by growers within a few months of planting. In any case, young trees from the older nurseries, where all the ground has probably grown citrus, are likely to carry *Phytophthora* infection. Thus the replanting site and the replanting material may be seriously affected with *Phytophthora citrophthora,* and so prejudice wholly or in part the success of replanting.

Fig. 3.—The Union of a Stunted Washington Navel Orange on Trifoliata Stock (Eight Years Old) showing Scaly Butt.
Note.—(*a*) Scaling extends to union; frequently it appears only at ground level. (*b*) Similar size of stock and scion.

Consequently, trifoliata has assumed a new importance in citrus growing in this State, and the elucidation of the cause of

the failure of Washington Navel orange and the other varieties of the unreliable group always to grow satisfactorily on it has become a matter of urgency.

Further investigations[12] have enabled the following classification of the reaction of citrus forms to the organism:—

Highly Resistant.

Poncirus trifoliata.
Citrange, var. Carrigo.

Resistant.

Citremon.
Citrange, var. Morton.
Tangelo, var. Sampson.
Tangelo, var. Thornton.
Sour orange.
Mandarin, var. Cleopatra.
Microcitrus, Sydney Hybrid.

Susceptible.

Eureka and Lisbon lemon.
Rough lemon.
Sweet orange.
Sweet lime.
Grapefruit, var. Duncan.
Grapefruit, var. Wheeney.
Citron, var. Bengal.
Citron, var. Knight.
Citrus excelsa.
Yuzu.

This work has demonstrated the outstanding importance of trifoliata as the main root rot-resistant root stock, and has shown that its hybrids appear to be the main sources of potentially new root rot-resistant stocks.

Other Root Attributes.—

Among other root attributes may be noted that it is susceptible to *Armillaria mellea,* but according to a recent report[7] it is resistant to citrus eelworm.

Effect on Fruit Qualities.—

It has been recognised that trifoliata stock confers distinctive qualities on the fruit and gives the tree an increased capacity to hold its fruit.

Improvement in quality of fruit over that on the commonly used rough lemon stock takes the form of thinner skin, better flavour and longer retention of juice and flavour when harvesting is deferred. The generally observed difference in flavour is supported by a three-year chemical examination of the fruit from Valencia and Washington Navel orange and Marsh grapefruit trees on three rootstocks—trifoliata, rough lemon and sweet orange[12]. "The best quality of fruit of the three varieties was produced by trees on Poncirus rootstock, the fruit being usually highest in specific gravity, acidity, soluble solids and flavour. Grapefruit on Poncirus stock was markedly sweeter and less bitter than fruit from other stocks. The oranges from Poncirus and sweet orange stocks held their palatability longer on the tree than fruit from rough lemon."

The fruit is also held more firmly on the trees, particularly at maturity, an effect which is specially noticeable in periods of heavy rain or in locations subject to flooding. The holding of the fruit on the tree and the retention of quality also show up noticeably following the incidence of light frosts. These are commercially valuable characteristics, particularly for certain varieties such as Late Valencia oranges and Marsh grapefruit.

Effect on Tree Growth and Productivity.—

All varieties on trifoliata stock are generally recognised to be rather slower growing in their non-bearing and early-bearing period. However, where they are not affected by dwarfing and scaly butt they are vigorous and attain adequate size in later life for the prevailing planting distances, and where root rot occurs they out-grow trees on rough lemon stock and survive after neighbouring trees on susceptible rootstocks have failed (Fig. 4).

In coastal New South Wales mature trees of Washington Navel and Valencia on trifoliata stock often show denser foliage and darker green, larger leaves and better shoot growth at the top than trees on rough lemon, which become open at the top owing to poor foliage and shoot growth in this position, due to root rot and possibly nematode attack. This maintenance of vigour in the mature tree has been observed to reduce the degree of infection by the black spot fungus (*Guignardia citricarpa*), which is well known to be less prevalent on vigorous trees. The Ellendale mandarin on rough lemon

stock often becomes unthrifty within a few years of attaining commercial bearing age in marked contrast to its behaviour on trifoliata stock.

In bearing propensities, trees on trifoliata stock are definitely precocious, often to an extent that early crops should be removed in order that the young tree may make more structural growth. Cropping is usually heavy in relation to the size of the tree, and there have been numerous observations that bearing is more regular on trifoliata than on rough lemon stock.

Frost Resistance.—

Numerous field observations indicate that trifoliata stock confers a degree of frost resistance on the tree greater than that shown by the same variety on rough lemon stock. This is, no doubt, partly because such trees have undamaged root systems, since trees slightly affected with root rot are much more subject to frost injury than trees with healthy root systems.

A striking illustration of the frost hardiness of trees on trifoliata is given by Webber[18].

Drought Resistance.—

Opportunities to compare the behaviour of the same variety on different stocks of identical age, when grown under drought conditions, have been few, and droughts when they occur are often so prolonged as to remove any differences which may have existed under conditions less acute. However, it has been observed on several occasions that under conditions of moderate drought some crop was matured on trees on trifoliata stock, whereas no crop was retained by trees on other stocks. Whether the effect was the result of the rather deeper rooting habit of trifoliata or of the development of a greater amount of root fibre can only be surmised. The later characteristic of trifoliata stock is well recognised.

Stunting and Scaly Butt.—

The most serious defect of the trifoliata stock is the stunting or dwarfing of certain scion varieties commonly associated with the development of scaly butt below bud union. If the incidence of dwarfing were uniform for a variety, allowance might be made for it by closer planting, but neither the proportion nor the degree is reliable. A range of variation in size of Washington Navel orange trees is shown in Fig. 1, which illustrates vigorous and stunted Washington Navel orange trees of the same age (8 years); Fig. 2 shows the typical appearance of the rootstock of a vigorous tree; and Fig. 3 the scaly-butted rootstock of a stunted tree.

The term "dwarfing" is, in fact, a misnomer, as it implies a specific stock-induced dwarfing. A preferable term is "stunting," especially in view of the evidence to be presented of the virus cause of the disease.

Fig. 4.—Replanted Orange Tree, showing Decline Through Root Rot.

The tree on the right is a common orange forty-four years old on trifoliata stock. That on the left is a replant, on rough lemon stock, twelve years old, now showing decline from root rot; it was replanted where the original tree died from root rot.

The varietal responses to trifoliata rootstock obtained in a survey of over 10,000 trees have been given[1], and are discussed in a later section of this paper on the results of investigations into scaly butt.

In the great majority of instances in New South Wales, stunting is associated with scaly butt. The association, however, is not invariable, and though scaly butt is commonest among excessively dwarfed or stunted trees, occasionally dwarfed trees are found without scaly butt. However, trees showing scaly butt are always dwarfed to a greater or lesser extent.

In private communication dated 14th August, 1944, A. F. Camp, Vice-Director, Citrus Experiment Station, Lake Alfred, Florida, stated that scaling occurs in Louisiana, but that dwarfing without scaling occurs in Florida. He also recorded having seen some scaling of trifoliata stocks in Argentina in one section, whilst in another section, the Concordia section, trifoliata stock produced outstanding trees free of dwarfing and scaling. In a recent short article Fawcett and Klotz[9] recorded scaling of trifoliata top-worked on grapefruit in California and state that "the nature or cause of exocortis (as scaly butt is called in California) is not known. It is believed that it is either due to a genetic factor . . . or that it is due to a virus."

(To be continued.)

Molybdenum Deficiency in Glasshouse Tomatoes.

First Record in New South Wales.

THE first case on record in New South Wales of molybdenum deficiency in a glasshouse tomato crop recently came to the notice of the Biological Branch, when specimens of plants were submitted by a grower at Ermington.

Clinical tests made on these plants, together with the symptoms and the fact that the soil in the glasshouse had been acid, indicated from the start that the condition was due to molybdenum deficiency.

When a departmental plant pathologist made applications of sodium molybdate to the plants, slight but definite visual responses were evident—and these were confirmed by chemical tests of the leaves of treated and untreated plants.

This case is only the fourth definite record of molybdenum deficiency in tomatoes in New South Wales, the earlier cases having been at Berkeley Vale, Horsley and Wetherill Park.

As far as is known there have been no reports yet of naturally occurring cases of molybdenum deficiency in commercial tomato crops in any other part of the world.

The present record is of interest not only as being the first case of this deficiency in a glasshouse crop (the three other cases having been in outdoor crops) but also as having been found within ten miles of the centre of Sydney.

The soil in the glasshouse concerned was a heavy clay loam.

Sod Culture in the Orchard.

Demonstration at Armidale.

As a joint project between the Department of Agriculture and the University of Armidale, an area of fruit trees is being planted on the property of the University in order to demonstrate the value of sod culture and to show that it is possible to grow fruit trees successfully with minimum loss of soil fertility.

Seven acres have been planted this season, and a further five acres next season will complete the orchard.

The Department has supplied pedigree trees for this demonstration, and Mr. E. C. Connor, Fruit Officer located at New England Experiment Farm, will act in an advisory capacity.

The University will supply all labour for working the orchard and will also carry out soil and other analyses during the lifetime of the trees.

Sod culture consists mainly of encouraging and maintaining a continuous growth of suitable plants such as clovers, etc., not only to improve the soil, but to minimise erosion and preserve soil structure.

Sod culture, however, cannot be adopted as widely as it deserves (particularly if irrigation facilities are unavailable) owing to the low and erratic rainfall common to many New South Wales localities.—DIVISION OF HORTICULTURE.

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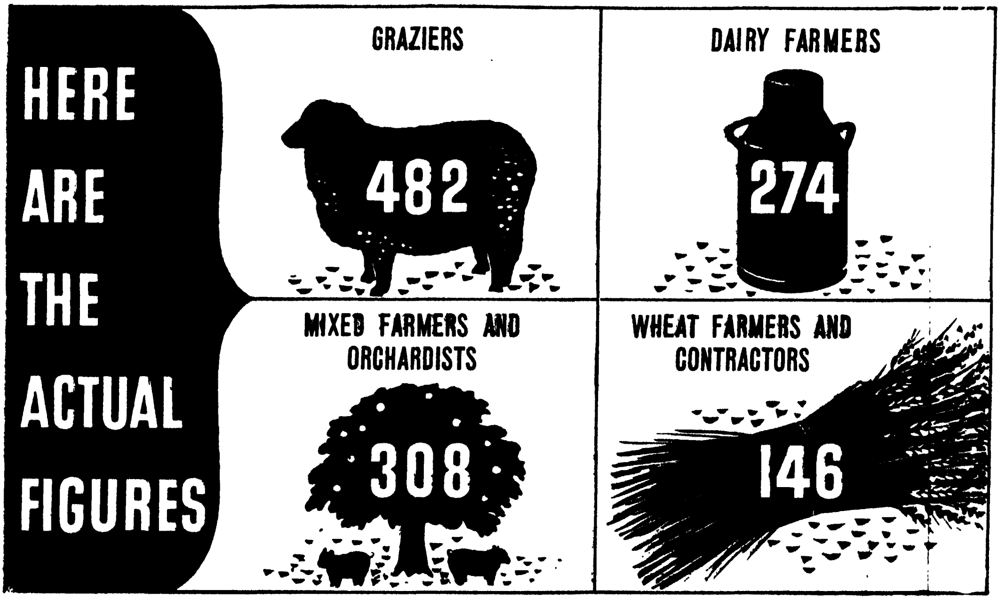

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PLANT DISEASES

BLACK SPOT AND DOWNY MILDEW
Of the Grape Vine

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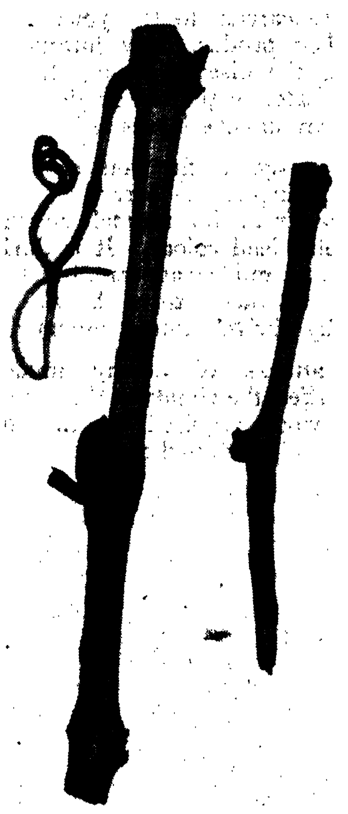
BLACK SPOT.

Black spot develops at much lower temperatures than downy mildew, and generally appears earlier in the season. All green parts of the vine—shoots, canes, leaves and bunches—are subject to attack.



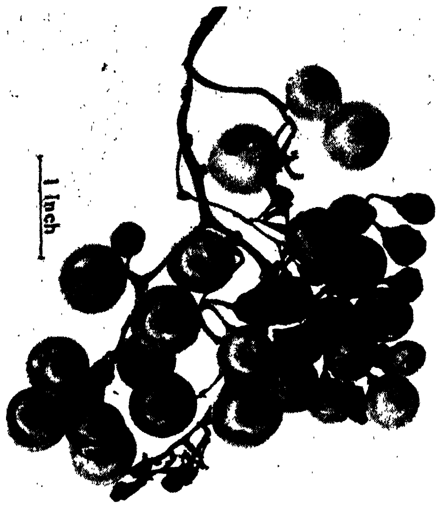
Black Spot Cankers on Canes and Tendrils.

The disease first appears in the form of brownish-black spots, which are slightly sunken in the centre, but raised at the border. The spots on the shoots tend to become elongated in the direction of the main axis, the colour becomes greyish, and, finally, definite cankers are produced. The bark may be destroyed and in severe cases the underlying wood has a burnt appearance. Infection of the short stems of the flowers often results in withering, and subsequent falling, of the flowers or young fruits. Affected stems bearing bunches are sometimes girdled.

The first signs of the disease on the berries appear in the form of dark-brown areas, which later develop into round spots with grey centres and dark borders, between which there may be a well-defined band of bright red. Spots on the foliage are, at first, pale grey with dark red borders, which later turn black. Eventually the centre may fall out of the spot, giving the leaf a shot-hole appearance.

The causal fungus is propagated mainly by spores which are formed in the affected tissues. The spores are produced in large numbers, and are disseminated by rain and dew. If the climatic conditions are suitable,

Black Spot on Grape Leaf.



Black Spot of Doradillo Grapes.

the spores which fall on the green parts of the vine may germinate, and about a week later the first signs of the black spot disease begin to appear.

Control Measures.

WINTER TREATMENTS.

1. *Burn Prunings.*—After pruning, all cuttings should be collected and burnt.

2. *Remove and Burn Loose Bark.*—If time and labour permit, the vines may have the loose, old bark removed and burnt. To leave it on the ground is worse than useless.

SPRING AND SUMMER TREATMENT.

3. *Spraying with Bordeaux Mixture.*—In the spring, when the buds are bursting, spray with Bordeaux (6-4-40). When the later buds are bursting, spray with Bordeaux again at summer strength (6-4-50). If weather conditions favour the disease, spray just before blossoming, and again as soon as the fruit has set.

Later applications must be governed by weather conditions. Weather conditions favourable to black spot are experienced when periods of frequent rain are followed by sunshine. If, through any cause, the spraying just before blossoming is delayed, and the weather conditions are favourable to the disease, it is better to continue the spraying rather than risk the destruction of the crop through the disease, but, as a rule, spraying should be avoided during the blossoming period.

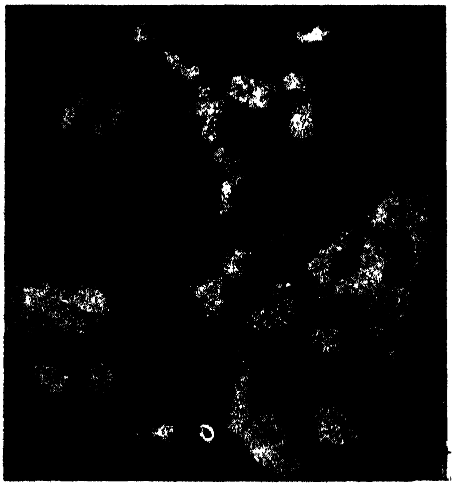
The spraying measures recommended for the summer control of black spot are equally valuable in controlling downy mildew, which, however, generally appears later in the season.

DOWNY MILDEW.

The first indications of this disease on the leaves appear in the form of dark, oily-looking patches on the upper surface, which later turn yellow and then brown. Upon the lower surface the spots are not at first so evident, but very soon they present a whitish, downy appearance—the "downy mildew"—owing to the formation of masses of fungous threads bearing spores. These spores are carried to the younger foliage, where they produce new infections, thus spreading the disease during the growing season. Later in the season the spots may turn brown and the leaves fall prematurely.

The first sign of the trouble on the fruit is a hardening of the berry, together with a change from its normal colour to a greyish-blue lead colour. It is during this stage that the mildew appears. In later stages the berry withers, turns brown or red, and finally shrivels into a mummy.

Late attacks of downy mildew may severely affect the vitality of the growing and pruning wood required for the following season. Badly affected canes may be killed.



Early Stages of Downy Mildew on Undersurface of Leaf of Zante Currant.

The fungus produces two kinds of spores. In the spring numerous spores are formed on the diseased spots on leaves and fruit. These serve to spread the disease quickly while the weather conditions are favourable.

In the autumn a special type of resting spore is formed within the tissue of the leaf itself and falls off with the leaf. It is probable that it is by means of these spores that the fungus lives on, winter after winter, producing fresh infection in the spring.

Control Measures.

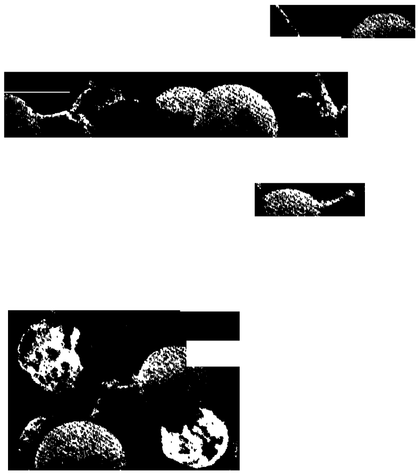
Bordeaux mixture (6-4-40) is most effective in the control of this fungus, and an endeavour should be made to keep a coating of the mixture continuously on the vine to prevent infection taking place. The disease can be controlled by systematic spraying and no grower should neglect this excellent type of insurance for his crop.

It should be emphasised that Bordeaux mixture must be applied *before* the disease makes its appearance, in order to ensure adequate protection. No hard-and-fast rule as to the time of spraying can be laid down. The outbreak of downy mildew is largely dependent upon prevailing weather conditions (*i.e.*, moist and hot).

In districts liable to black spot (see Plant Disease Leaflet No. 5), Bordeaux spray (6-4-40) given when the early buds are bursting will also protect the vines for a short period against a very early attack of downy mildew. If the grower finds it unnecessary to take measures against black spot he should apply his first spray for downy mildew when the shoots are about 9 inches long—not later. As new growth appears the vines should be re-sprayed—roughly at intervals of about two weeks.

Generally speaking, downy mildew attacks vines later in the season than black spot—chiefly when the fruit is set. In some vineyards as many as six applications of spray are made. It is important that the Bordeaux should be freshly made when applied.

In abnormally bad seasons, Bordeaux mixture made to a strength of 10-5-50 may prove an advantage.



Downy Mildew on Grapes. [*After Duggar.*

Although sulphur is the recognised treatment for prevention of oidium or powdery mildew, systematic spraying with Bordeaux mixture will also prevent this disease from becoming established.

Blossom-end Rot of Tomatoes

ALMOST every season losses occur in tomatoes as the result of the disease known as blossom-end rot. The abnormality is due entirely to certain unsatisfactory growing conditions and cannot be controlled by sprays or dust.

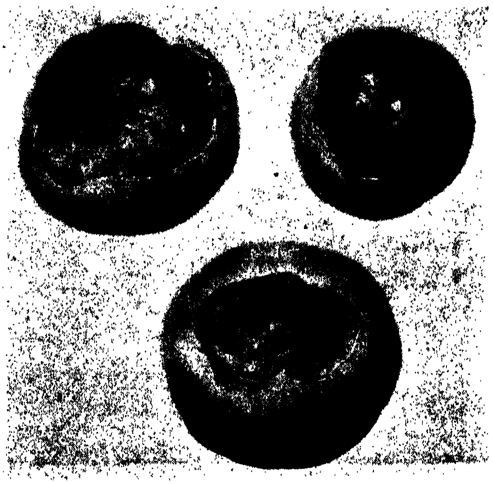
Symptoms.

The first sign of the disease occurs as a water-soaked area at the blossom-end (bottom) of the fruit. This area later turns brownish in colour, becomes somewhat

sunken and develops a leathery texture. At this stage, the tissue is dead and is often atacked by fungi which may cause a velvety, greenish-black growth to appear on the affected area.

In some instances, the dead tissue is not visible from the outside but occurs as an internal, dark-brown, somewhat corky mass located centrally, and up to an inch from the blossom end. The internal symptom of the disease is very common in egg-shaped tomatoes such as San Marzano.

The disease causes obvious symptoms only on the fruit. There are no corresponding spots on either leaves or stems, and the plant itself usually appears to be more or less normal.



Tomatoes Affected with Blossom-end Rot.

Causes of the Disease.

Since it occurs near the extreme limit of the water-conducting vessels, the breakdown of the tissue is probably due to an insufficient water supply.

Inadequate supply of water may come about in various ways. For example, a period of drought which follows on a season of normal rainfall is often responsible for a diminution of the water available to the fruit.

Water-logging of the soil will also cause a stoppage of water-absorption by the roots and thus have the same effect as drought. Again, in dry areas where irrigation is essential for the growth of the crop, too long a period between applications of water will result in conditions of alternate good growth and water starvation.

Even when the soil moisture is in its optimum concentration, hot dry winds may cause an excessive loss of water from the leaves and, under such circumstances, the supply of water to the fruit may be reduced to the danger level.

All the above conditions are much more likely to cause the development of blossom-end rot than would continuous, but regular, semi-drought weather.

Although irregularity of water supply is the most usual cause of the disease, other factors are known to be important. Too much nitrogenous fertilizer, in addition to reducing the yield, is capable of paving the way for an outbreak of the disease. On the other hand, the use of abundant quantities of superphosphate is claimed to reduce the amount of blossom-end rot. Owing to the ability of tomatoes to grow on acid soils, it is common to find that lime is omitted from the fertilizer programme. There is some evidence to show that once the lime content of the soil reaches a low level, blossom-end rot tends to increase.

Control Measures.

1. Where possible, make sure that a satisfactory amount of water is always present in the soil. Drainage will avoid waterlogging, while sprinklers or open-furrow irrigation will avoid drought. Farmyard manure or green-manure crops help to retain moisture as well as to improve the fertility and texture of the soil.

2. Avoid the use of excessive quantities of nitrogenous fertilizers and see that sufficient superphosphate and lime are applied to the soil.

3. In exposed positions, subject to hot dry winds, windbreaks are desirable.

4. In general, the varieties which bear smaller, flatter fruits are more resistant to the disease.

Beauty and the Beast

The same old story but a different setting—the Beast must die if there is to be a "they lived happy ever after." Spray regularly with Gargoyle White Spraying Oil and Arsenate of Lead from petal fall to picking time at intervals from 7 to 10 days. The oil will smother the moths' eggs while the lead will get the grubs that miss the oil.

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FRUITGROWING

CONTOUR FURROW IRRIGATION OF ORCHARDS

On the Murrumbidgee Irrigation Area

TO AVOID UNEVEN WATERING

(*Concluded from page* 475.)

A. H. SKEPPER, H.D.A., Fruit Officer.

MANY troubles follow when the supply of irrigation water to trees is uneven as the result of variation in the slope or grade of irrigation furrows. Unthriftiness of trees (as the result of too little or too much water), furrow silting and other types of soil erosion, uneven cover crop growth (affecting soil fertility) and damage to soil structure following excessive grading in attempts to overcome the trouble, are commonly seen.

The purpose of this article is to set out the value of contour furrow irrigation as a means of avoiding these troubles on the Murrumbidgee Irrigation Area, and to describe the methods of designing and planting up of an irrigation area on this system. The first instalment appeared in September issue.

Types of Lay-out.

In general there are two types of contour lay-outs suitable for contour furrow irrigation. In the first, the trees are planted at a uniform spacing along the grade contour without regard to the alignment of the trees into crops and rows; and in the second the trees are unevenly spaced along the graded contour row, but aligned into straight cross rows.

Where the trees are planted on the first system, *i.e.*, at a uniform spacing along the grade contour and not aligned into cross rows (Fig. 5), cross cultivation may be difficult, if not impossible, on land with irregular topography. This system has the disadvantage of rendering it more difficult to detect breakaways from furrows which may occur during irrigation. Orchards planted on this system, being cultivated in one direction only, tend to become terraced, which is an advantage on steep hillsides. This system is mainly used on land with an irregular topography.

Uneven spacing of trees along the graded contour row with the trees planted in straight cross rows (Fig. 6), permits cross cultivation, but care must be exercised if this cultivation is performed to ensure that the levels along the irrigation run are not upset, causing furrow breakaways. This system, which is usually used on land with long, even slopes, may result in fewer trees per acre than planting on the first system. This, however, may be minimised by adjusting the space between the cross rows.

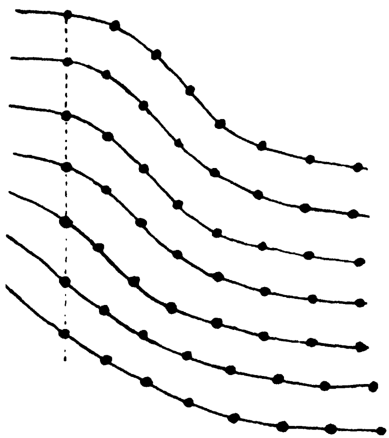

Fig. 5.—Contour Block Planted with Trees Equally Spaced Along Contour Rows.

The trees are not aligned into cross rows. Headland trees along the supply ditch are usually planted in a straight line.

Pegging Out the Contour Rows.

A minor contour map of the area, while not necessary for the pegging out of the tree lines, is useful for determining the general lay-out of the farm and for locating the position of supply pipelines or ditches and drainage. Under no circumstances, on hillside blocks, should one try to place the tree and row locations on the map, and then try to fix them in the field. Row and tree location must be done in the field by someone with experience in contouring.

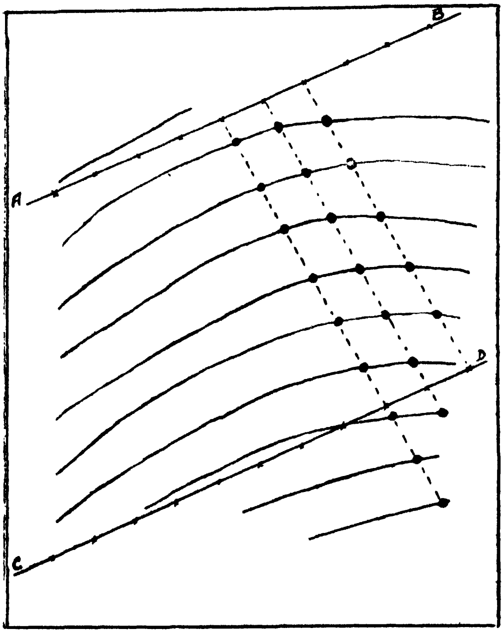

Fig. 6.—Contour Planted Block with Trees Aligned Into Straight Cross Rows.

The location of the tree rows is determined by the use of either an "A" frame, or an engineer's level. If an "A" frame is used it must be accurately constructed if good work is to be done. Whatever instrument is used, for accurate work to be done—and accuracy is essential with the falls used—it is necessary to have the land smoothed prior to pegging-out.

A general procedure is to start at the top of the block, pegging each alternate row, the intervening row being taped-in half way between the set rows. Owing to variation in slopes of the land the spaces between the rows will vary somewhat. This variation in row spacing may sometimes be reduced slightly by minor changes in the grade; however, changes in grade of more than ½ inch per chain should be avoided if uniform irrigation is to be achieved. Variation in row spacing is generally preferable to changes in grade. It is considered that for standard 22 feet spacing variations of 2 feet below or 6 feet above this will not cause any undue difficulty.

Where changes in the slope of the land are fairly sudden it is usually necessary to introduce short rows into the design. While these are undesirable, they are often unavoidable.

Minor hills and hollows which can be easily graded out should be ignored when finally aligning the rows. Sharp kinks and bends caused by them should be smoothed out. It is not wise, however, to shift the pegs more than a foot or two sideways when rounding out the general curves in the rows, as difficulties with the grades in the irrigation runs may be met, resulting in the irrigation furrows breaking during watering, requiring excessive grading to correct the defect.

After pegging the rows it is a good plan to run a large furrow along the tree lines. This will minimise the danger of erosion should a storm occur, and at the same time can be used for the first irrigations of the young newly-planted trees.

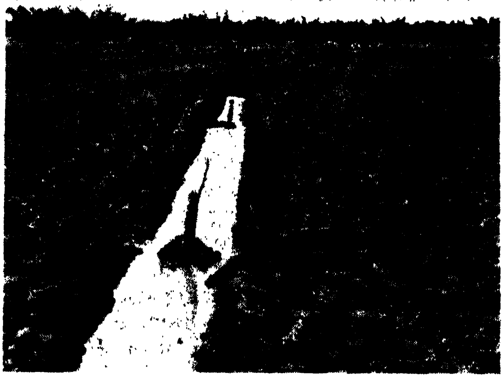
Fig. 7. -Irrigating Newly-planted Trees Planted in the Furrow.

Fixing the Tree Positions.

To peg the tree positions when system No. 1 (trees uniformly spaced along the contour grade line) is being used, all that is necessary, once the rows have been fixed,

Fig 8.—Trees Stunted as a Result of Insufficient Water Penetration when Planted on Too Steep a Slope.

is to start from the irrigation supply end of each row, and with a tape, measure the planting distance between each tree (see Fig. 5).

If system No. 2 (trees aligned into straight cross rows) is being used, then it is necessary to have two base lines from which to line up the cross rows. These base lines should be as near as possible parallel to one another and follow the general direction of the contour rows. Measure

Fig. 9.—Trees in Same Row as those in Fig. 8, but at End of Row on Flatter Grade.
These trees receive sufficient water.

along these base lines the intervals between each cross row, marking each row with a large peg (see Fig. 6—lines AB and CD). Sighting across these base line pegs, peg a tree position whenever the line of sight intersects a contour row. The space between the cross rows may have to be reduced somewhat if the space between the trees in the contour row becomes too great. This will occur where the contour rows tend to run diagonally to the cross row. Where the contour rows are following a circular pattern, such as on a knoll, and where there are more trees at the base of the hill than at the top, the cross rows are usually placed radially (see Fig. 5).

Advantages and Disadvantages of Contour Designs.

Contour planting for furrow irrigation provides as uniform an irrigation slope as it is possible to get, without the necessity of

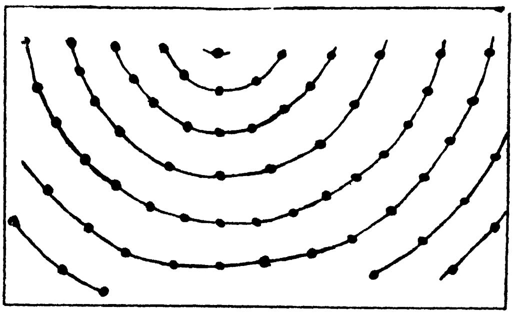

Fig. 10.—Contour Planting on a Knoll, showing Alignment of Trees into Radial Cross Rows.

extensive grading and earth moving. It does not mean that grading will be unnecessary, as there are certain to be minor hills and hollows that will need smoothing out, but it does mean that correct grades are obtainable without having to change the natural slope of the land.

Having a uniform slope means that uniform watering is made possible with the least effort, and it will be found that each row will finish watering at about the same time if uniform flows are used. This saves a great deal of time, labour and walking during the irrigation.

Furrow erosion, and in fact soil erosion in general, is reduced to a minimum. This is particularly important on hillslopes, where erosion means expensive soil shifting to replace lost soil on the top of the block.

The result of the uniformity of watering will be reflected in the growth of the trees and cover crops. With the irregular penetration that so often results from the irregular and faulty slopes of straight line plantings, the regions of poor penetration usually grow poor cover crops, and so soil structure deterioration associated with cultivation is greatest on these areas. This structure loss means a further reduced rate of water penetration on just the spots where increased penetration is needed—and so a vicious cycle develops to the detriment of the trees. Contouring is the best safeguard against this condition.

There is, however, a minor disadvantage of contour planting—that under some conditions of land topography cultivation may be a little more difficult. When this slight disadvantage is weighed against the advantages gained and the added benefit of maintenance of the fertility of the land, there

Fig. 11.—Erosion Caused by Furrow Breakaway.

is a big balance in favour of contour layouts on all land with a natural slope greater than that required for efficient watering.

The widespread adoption of contour layout will not necessarily mean a complete departure from straight line planting, as often contouring will give straight rows, as on land with a uniform slope. What it does mean is that whenever it is necessary, in order to maintain a uniform slope, to depart from straight rows, the change in direction will be made.

Management of Contour Furrow Irrigated Orchards.

Generally speaking, a contoured block will require but little departure from normal tillage practices. However, some precautions are necessary when there is a steep

Fig. 12.—Water Distributor which Enables Headland Erosion to be Avoided on Hillsides.

This was made by Mr. P. Combe of Griffith. The flow from each outlet can be controlled.

cross slope. Care must be taken to guard against water breaking out of the furrows. This means that the furrows must be well made and of large capacity, so that they do not overflow. The furrows must also be kept free of obstructions, such as excessive weed growth, and excessive flows which will overtax the furrow capacity must not be used.

Cross cultivation on hillsides, if carried out, should be as infrequent as conditions will permit, and care taken to see that it does not upset the grade in the irrigation run. The final cultivation should be along the contour row.

Leaving a strip of grassed, uncultivated land along the centre of the contour rows will also minimise the dangers of erosion on hillsides. Where there is a danger of soil erosion it is desirable to have banks along each row of trees. These will protect against irrigation accidents and also run-off from heavy storms.

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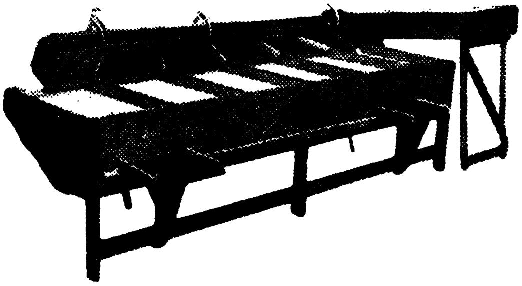

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RED SPIDER AND MITES. Spray with Neptune White Spraying Oil. This may be combined with Neptune Arsenate of Lead spray.

CODLING MOTH. Use a calyx spray of Neptune Arsenate of Lead plus Neptune White Spraying Oil.

WOOLLY APHID. Spray with Neptune Black Leaf 40 plus Neptune White Spraying Oil. This may be combined with Arsenate of Lead sprays.

BLACK SPOT, APPLE AND PEAR. Spray with Neptune Lime Sulphur Solution. Consult our technical service or Government Field Officer for programme.

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All these precautions will be wasted if irrigation furrows—and the banks, if constructed—are not connected to the stabilised drains. Badly eroded footlands mean much work in repairs.

These precautions may seem to involve a lot of extra work. Actually all they call for is a little extra care and common sense when irrigation is being done across steep hillsides. Farmers interested in contour planting and desirous of planting up new areas or replanting old land would be wise to contact their local Extension Officer during the year prior to the one when planting is to be done. This will make it possible to construct any necessary drains and have them grassed and stabilised before they are needed to carry water.

PARENT POME AND STONE FRUIT TREE REGISTRATION SCHEME

C. G. SAVAGE, Chief, Division of Horticulture.

IT is proposed to establish a scheme to provide for bud selection for deciduous trees by means of a parent tree registration scheme, whereby a nurseryman may inform the Department of Agriculture of the source of his propagatory wood supply, and following inspection, these trees may be registered by the Department.

The scheme is being put into effect at no additional cost to nurserymen, and it is confidently expected that all New South Wales nurserymen will forward the particulars requested and assist in the operation of the scheme.

Registration will be on an annual basis, and can continue as long as the various conditions which are enumerated in the accompanying statement are complied with. It is intended to publish annually a list of nurserymen who are parties to this scheme.

Conditions Governing the Deciduous Parent Pome and Stone Fruit Tree Registration Scheme.

(1) Any fruit tree nurseryman is invited to inform the Department of Agriculture of the source from which he obtains propagating material of the pome and stone fruit varieties listed.

(2) Following receipt of the above information, officers of the Department will inspect these parent trees with a view to checking type, disease, etc., and as to whether, in their opinion, the selected trees are suitable for reproduction purposes, and the grower sufficiently co-operative. Prior to registration it is proposed to inspect the trees over a period of two consecutive growing seasons.

(3) Provided the trees are at the time of inspection, and continue to be, true to type and free from disease, and in other respects are considered suitable as parent trees from which propagatory material could be obtained, and provided the grower supplying the bud wood is co-operative with both the nurseryman and the Department, these trees will be registered by the Department.

The nurseryman should then deal direct with a grower or growers for the purchase or otherwise, obtaining such material as may be required. The question of maintaining parent trees in a satisfactory condition for production of wood for propagation purposes is a matter to be arranged between the nurseryman and the grower-supplier.

Registered trees will be inspected annually by officers of the department, and registration will be continued as long as the above conditions are complied with, and registered trees are used as the sole source of material of that variety required by nurserymen.

(4) The Department will maintain a record showing the condition of and location of parent trees and will supply the nurseryman and grower concerned with a plan.

(5) The following varieties are included in this deciduous parent tree registration scheme.

Apples:—Granny Smith, Delicious, Jonathan, Rome Beauty, Early McIntosh, Gravenstein, Kirks Carrington, Willie Sharp, Mobbs Royal.

Pears:—Williams, Packhams, Winter Cole.

Peaches:—Aunt Becky, Bell's November, Bell's Improved, Blackburn, Dripstone, Elberta, Early Becky, Frome, Governor Rawson, Golden Queen, Halehaven, J. H. Hale, Phillips Cling, Pullars Cling, Rowe's Champion, Shanghai Seedling, Vincent, Wight, Watts, Watton, W. H. Spinks, Young's Cling.

Apricots:—Glengarry, Newcastle, Early Moorpark, Trevatt, Moorpark.

Cherries:—Early Lyons, Eagles Seedling, Napoleon, Florence, Blackboy, St. Margaret, Ron's Seedling.

Nectarines:—Early Rivers, New Boy, Goldmine, Bowman's.

English Plums:—Angelina, Grand Duke, President.

Prunes:—Prune d'Agen, Robe de Sargeant.

Japanese Plums:—Wilson, Santa Rosa, Narrabeen, Wickson, Satsuma, Upright Blood, Burbank, Chalco, Sultan.

(6) If considered advisable, the Department will add to the list of varieties and arrange for inspection and registration of such trees.

Control of INSECT PESTS OF TOBACCO

New Insecticides Tested

W. L. MORGAN, B.Sc.Agr., Entomologist.

TOBACCO has been grown in New South Wales for many years, the industry being at a peak of prosperity in the early 1930's when more than 1,000 acres were grown each season. From 1939 onwards the industry declined, and recently the area cropped annually has been the vicinity of 400 acres, the established centres of production being at Texas and Ashford, with but one grower remaining in the formerly important tobacco district of Tamworth.

Owing to the present dollar shortage a policy of vigorous encouragement to tobacco growing is being followed, and in an effort to maintain and increase production in this State a technical committee of State and Commonwealth officers has been formed to consider means for improving the industry. In 1948 this committee reported that better methods of insect pest control seemed necessary, and the Entomological Branch of the Department was asked to assist in this direction. It was found possible last season to review the generally accepted methods of pest control and, in collaboration with the Division of Plant Industry, to carry out some demonstrations of methods likely to result in improved practices.

Insect Pests of Tobacco.

The chief insect pests of tobacco are elephant beetle or vegetable weevil (*Listroderes obiquus*), cutworm (*Noctuidae*), camel grub or looper (*Plusia* sp.), budworm or Heliothis caterpillar (*Heliothis armigera*), leaf-miner (*Gnorimoschema operculella*) and stem-borer (*Gnorimoschema heliopa*). Elephant beetle and cutworm may infect seed-beds and crops soon after they are transplanted, destroying many plants; looper and budworm cause extensive foliage and shoot damage; while leaf-miner and stem-borer may infest seed-beds and field crops, causing much destruction of plants and unevenness in growth.

A Review of Past Methods of Control.

For many years past the generally accepted method of controlling insects pests in tobacco had been to dust the plants with lead arsenate (1 lb.) or Paris green (¼ lb.) mixed with pollard (24 lb.), although sometimes the two insecticides were used together in pollard. A disadvantage of Paris green was that it sometimes scorched the foliage and damaged the growing shoot. The pollard mixture was shaken on to plants by means of an elongated can such as a 7 lb. treacle tin, with holes punched in the bottom. When plants became too tall for convenient use of the can-duster, the shoots and terminal growth were dusted by hand.

Neither method of treatment was laborious, and plants along the row could be treated quickly at fast walking pace. Pests which could be controlled by dusting with lead arsenate or Paris green and pollard mixture were elephant beetle, cutworms, looper and budworm, but the method was ineffective against leaf-miner and stem-borer.

Leaf-miner and Stem-borer Damage.—
Leaf-miner and stem-borer are caterpillars of small moths which lay their eggs mainly on the leaves. Upon hatching from the eggs the caterpillars of both species tunnel into the plant. The leaf-miner destroys the tissues between the upper and lower leaf-surfaces, causing transparent, papery blisters in the leaves. Stem-borer causes a gall-like swelling near the base of the stem in young plants, but in somewhat older plants the stem may not be noticeably swollen, first signs of infestation being wilting and withering of the shoot and terminal growth. The leaf-mining caterpillar also attacks the stem, and

plants infested with stem-borer generally have both species of caterpillars tunnelling in the stem a little above ground level.

Leaf-miner and stem-borer infestation may commence in seed-beds or the field. Affected seedlings generally are considered not to be worth transplanting, while young transplants may be killed outright or their shoots destroyed and much plant replacement may be necessary. Later, when plants are well established and up to 2 feet high, shoots may wither and die and the infested plants have to be cut back close to ground level below the damaged portion of the stem. Plants that are cut back usually make rapid regrowth, but develop suckers profusely and must be desuckered periodically to secure a single vigorous stem.

Thus, in crops infested by leaf-miner and stem-borer, much time is spent on plant replacement and in cutting back and desuckering; and this interrupts the work of chipping, cultivating and irrigating which must be carried on in regular routine to secure satisfactory yield and good quality leaf.

In infested crops there is also much unevenness of growth between plants, and this is important in connection with the curing of the leaf. Leaves from different positions along the stem dry and cure at different rates, and the curing barn should be filled with leaves taken progressively from the same position on plants—from low down near the base of the stem, from about the centre of the stem and from the upper portion of the stem, as the crop matures. Uniformly good colour and quality in the cured leaf cannot be obtained when top, middle and bottom leaves are cured together—as must inevitably occur in harvesting leaf-miner and stem-borer infested plants.

RECENT DEVELOPMENTS IN CONTROL.

DDT Controls Leaf-miner and Stem-borer.—

From the foregoing it will be apparent that the important objective in last season's investigations into tobacco pests was to demonstrate a control for leaf-miner and stem-borer.

Canon* (1946) in Queensland had used DDT to control leaf-miner in tobacco, recommending fortnightly treatment of seed-beds and three fortnightly applications to field crops. In view of these results and of the effectiveness of DDT against various species of caterpillars it was anticipated that DDT would control stem-borer as well as leaf-miner in New South Wales crops and be of some value in preventing damage by other pests. Growers accordingly were advised last season to treat seedlings throughout their growth at weekly intervals with 0.05 per cent. DDT emulsion spray or 1 per cent. DDT dust, and to treat field crops fortnightly with 0.1 per cent. spray or 2 per cent. dust. Three fortnightly applications were to be given in the field, treatment commencing two weeks after transplanting.

During the season these recommendations were tested in experiments and demonstrations on several tobacco farms at Texas and Ashford and were shown to be effective for the control of stem-borer as well as leaf-miner. Knapsack sprays and dusters were used and spraying and dusting were equally effective.

About 25 gallons of 0.1 per cent. DDT spray or 20 lb. of 2 per cent. DDT dust were used per acre of field crop at each application. For 300 square feet of seed-bed, which should supply sufficient plants for 1 acre of field crop, about 1 gallon of .05 per cent. spray or ¾ lb. of 1 per cent. dust was required at each weekly treatment. In field dusting a single puff of dust was directed on to each plant and in spraying a good cover of the upper surfaces of leaves was obtained without attempting to treat the undersurfaces—which are difficult to spray because of the flat to drooping nature of the leaves.

The cost of controlling stem-borer and leaf-miner with DDT by weekly treatment of seed-beds, followed by three fortnightly applications in the field was established at 15s. per acre for sprays and £1 15s. per acre for dusts. With knapsack equipment an operator could spray an acre in about 3 hours, or dust it in 1½ hours.

In nematode-infested soils at Ashford it was noticeable that plants made weak regrowth and produced little or no leaf for curing when they were cut back because of stem-borer injury, whereas the plants not affected by stem-borer, and therefore not cut

* CANON, R. C.—1946: *Qld. Agr. Jrnl.* 63: 204-207.

back gave satisfactory yields of good quality leaf. It is thought that in this district the use of DDT to control stem-borer and leaf-miner will enable tobacco to be grown profitably despite the occurrence of nematode, provided soils are brought to good condition through crop rotations and green manuring and irrigation is used judiciously to maintain soil moisture at a favourable level throughout the growth of the tobacco crop. These observations are not offered as a solution to the nematode problem at Ashford, but under most circumstances such practices should at least enable tobacco to be grown there profitably.

DDT Against other Tobacco Pests.—

In one instance where tobacco seed-beds were situated near weed infested ground, elephant beetles migrating in large numbers from the weeds destroyed many of the young seedlings. Dusting the beds with 1 per cent. DDT failed to protect the plants; though the insecticide killed the beetles it was not sufficiently quick acting to prevent feeding, and seedlings continued to be destroyed. This was the only instance of insect damage to seedlings receiving weekly treatment with DDT. The grower concerned overcame the trouble by dusting a wide strip around the seed-bed with Paris green mixed with pollard.

In young tobacco crops treated three times with DDT at fortnightly intervals, cutworms and elephant beetles were not troublesome, but there was some damage from looper and budworm, the damage being less with 2 per cent. dust than with 0.1 per cent. spray. Either treatment, however, prevented any serious injury. At this early stage of growth the leaves that later were harvested for curing had scarcely commenced to develop, and the small amount of looper and budworm damage on plants that were sprayed or dusted with DDT did not affect the value of the crop for curing.

During the late stages of growth neither dusting nor spraying with DDT at fortnightly intervals was effective against budworm, mainly because of the impracticability of treating the under-surfaces of leaves. Thorough spraying or dusting with DDT could be expected to give control, but the cost in labour and materials for treating large plants would be considerable. Moreover, a DDT residue problem undoubtedly would be created.

The established method of controlling budworm by dusting the shoots with lead arsenate-pollard mixture is inexpensive and prevents serious damage if frequently applied. Experience over the years has shown this method to be safe from a residue viewpoint, provided the mixture is applied in moderation to the shoots and terminal growth only. The material is stated to be a bait upon which budworm caterpillars feed. In comparative tests with DDT and lead arsenate mixed with pollard, DDT appeared to be the more effective, and indications were that DDT might replace lead arsenate in pollard dusts for budworm control.

DDT Residues.—

To determine whether a residue problem seemed likely to arise through the use of DDT sprays, leaves from plants that were sprayed four times at fortnightly intervals during early field growth were submitted to the Chemist's Branch for analysis. The leaves, which were collected thirty-five days after the last spray application, when they were mature and fit for curing, showed no DDT residue. In a similar test using 0.2 per cent. emulsion, the residue was 1.4 parts per million, though in this instance the shoots of the plants had also been treated with a 0.5 per cent. DDT pollard mixture which was applied three weeks before the leaves were collected for analysis.

The safe tolerance for DDT residues on fruit and vegetables is generally accepted as being 7 parts per million and it is concluded that a residue problem is unlikely to arise out of present recommendations for the use of DDT on tobacco.

Present Recommendations for Control.

Seed-beds should be treated each week with 0.05 per cent. DDT spray (1 fluid oz. 20 per cent. emulsion to 2½ gallons of water) or with 1 per cent. DDT dust. In the field, crops should be treated three times at fortnightly intervals with 0.1 per cent. DDT spray or 2 per cent. DDT dust, and treatment should commence within a fortnight of transplanting, as plants are very susceptible to insect damage while they are becoming established in the field.

(*Continued on page 556.*)

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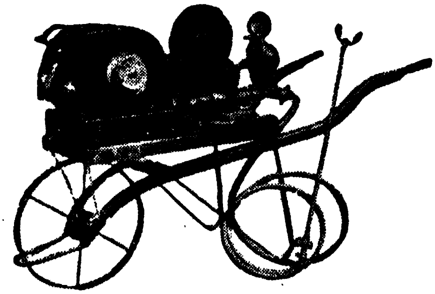

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INSECT PESTS.

Notes contributed by the Entomological branch.

SNAILS AND SLUGS

(*Helix aspersa* and *Limax* sp.)

Increase Favoured by Recent Exceptional Rains

THE past six months have been exceptionally favourable for the development of snails and slugs in the metropolitan area, the winter on the central coast having been more than usually mild and rainfall far above the average.

The first half of June was abnormally wet and mild, and will be remembered by the severe floods in the Hunter, Warragamba and Nepean valleys. Rainfall for June was more than four times above average and was the heaviest ever recorded for the month in the metropolitan area. Excessive rain was also experienced on the central and south coast. This heavy rainfall period was followed by several weeks of cold and frosty weather.

Light frosts only were experienced on some of the near-metropolitan vegetable-growing flats, but the past season has been exceptionally free from frosts, and trees and shrubs have blossomed early.

This exceptionally wet but mild period was caused by the absence of the usual winter southerly disturbances which are responsible for cold dry winds in the coastal area and are usually the fore-runners of frosty periods. An entirely different winter was experienced in some of the inland areas where very heavy snowfalls were common.

Both 1947 and 1948 were characterised by very persistent rains during the summer and autumn months, but the winters and springs were on the dry side. This present season has followed a similar summer and autumn pattern, but on the coast, rains have shown a tendency to persist through the winter and early spring. Rainfall recordings, for the months January to August, inclusive, have ranged up to and beyond 60 inches compared with an average yearly rainfall of from 36 to 46 inches for various parts of the metropolitan area. It is, therefore, not surprising that snails and slugs, which thrive under moist conditions, have become a matter of considerable concern to metropolitan growers, and particularly to home gardeners.

Life Cycle.

Both snails and slugs are related to the oysters, limpets, etc., and being hermaphrodite animals, every individual can lay eggs. The eggs, which are deposited in the soil, are rounded and whitish, and are laid either singly or in clusters.

Snails and slugs are long-lived, and take four or more months to reach maturity. They thrive best under moist conditions, and following rain may appear in large numbers from their hiding places. They are always present to some extent in cultivated areas, particularly where the plants are regularly watered. Although they usually hide by day and commence to come out in search of food at dusk, numbers, at times, may be seen crawling about on dull wet days.

Control.

Clean cultivation is an important factor in the control of these pests. Snails and slugs feed on weeds, etc., as well as cultivated

plants. It is essential, therefore, as a preparatory control measure, first to remove weed growth adjacent to cultivated areas, and also any accumulated rubbish or other materials under which the pests may be able to shelter.

Weed growth may be sprayed with sodium arsenite or DNOC weed-killers. In addition to the killing of the weeds, the sprayed plants act as a barrier strip in which snails and slugs will be killed before they can reach the crop, until these water-soluble materials are eventually washed away by dews, or rain, or irrigation. Both types of weed-killers are available commercially and the manufacturer's directions for use should be carefully followed. It is stressed that both materials are weed-killers and should not be sprayed on garden plants.

On small areas, snails and slugs may be "hand collected" and destroyed, but on large areas, and where they are present in great numbers, they are best controlled by the use of poison baits or by spraying or dusting the plants with a poison.

Common Shell-back Snails Fastened to the Trunk of an Orange Tree during Dry Weather Conditions.
[After Basinger.

Poison Baits.

A poison bait recommended may be prepared according to the following formula:—

Calcium arsenate	1 oz.
Bran (approximately 9 breakfast cups)	1 lb.
Water	1 pint.

The calcium arsenate and bran are mixed thoroughly while dry, and then made into a crumbly mash with the water. The bait is scattered in a thin layer on the soil along the rows of plants and in other places where the snails or slugs are known to congregate. The bait is best applied late in the afternoon or at night to ensure that it remains moist, as it is unattractive in a dry condition. The snails and slugs may not be killed in appreciable numbers for two or three days.

Another bait recommended contains 1 to 2 per cent. of metaldehyde. The formula for the 2 per cent. mixture is approximately as follows:—

Metaldehyde (finely powdered)	1/3 oz.
Bran	1 lb.
Water	1 pint.

This bait is prepared in a similar manner to that described for the calcium arsenate bait, and is set out in small pellets. The snails and slugs are attracted to the bait and after feeding become paralysed and die in the vicinity of it. It appears to be more effective in situations where these pests are later exposed to the sun.

The metaldehyde-bran bait may be fortified by the addition of either 1 oz. of calcium arsenate, or ½ oz. of Paris green, to the pound of bran. Such a bait has an increased killing efficiency, particularly against slugs, and is therefore not dependent on exposure of affected slugs and snails to the sun, for really effective results.

Another useful bait consists of inferior potatoes or sweet potatoes, which are first boiled and then sprinkled with dry Paris green.

All the above baits are poisonous and poultry and domestic animals should not be allowed to feed on them.

Poison Sprays and Dusts.

Where plants may be treated with arsenicals, they may be sprayed or dusted with arsenate of lead. The concentrations

normally used are 3 oz. of lead arsenate in 5 gallons of water, or a 20 per cent. lead arsenate powder (4 oz. lead arsenate, 16 oz. kaolin).

Conditions favourable for snail activity are essential, if effective results are to be obtained with either baits or sprays. These conditions obtain during showery weather and during these periods spraying or dusting cannot be carried out and water-soluble poisons would soon be washed off. It is not generally recognised that snails and slugs are not continuously active, but become active only in bursts during the favourable conditions mentioned above. In dry weather, snails go into a resting stage, and may be found clustered in numbers on trunks of trees, fences or stones.

A spray which has given the most satisfactory control in citrus orchards, is Bordeaux mixture, particularly if combined with white oil. Young snails are killed readily, and if the bodies of the large snails are wetted a satisfactory kill follows. The chief advantage of the Bordeaux mixture-white oil spray is its residual effect, and, in practice, is it found that sprayed trees do not become re-infested for several months—and in some cases, this repellent effect has been obvious even twelve months after spraying.

Two and one-half gallons of Bordeaux mixture, for snail control, may be prepared by dissolving 1 oz. of bluestone (copper sulphate) in 2 gallons of water. This can be done quickly by using a little hot water and then making up (with cold water) to the full two gallons. Use only a copper, wooden, enamelled or earthenware vessel for the bluestone, as iron or galvanised containers are quickly corroded. Slake 1 oz. of quick lime with a small quantity of water, and make up to ½ gallon. A slightly larger amount of hydrated lime (1½ oz.) may be used instead of the quicklime. The lime mixture should then be poured through a fine strainer into the bluestone solution, stirring all the time with a wooden stick. White oil, 4 fluid oz., is emulsified wth a small quantity of water and added to the Bordeaux mixture to improve its wetting and sticking qualities.

The repellent property of the Bordeaux mixture-white oil spray may be used with advantage in the home garden, as small and susceptible plants may be given an over-all protective spray, while baiting can be systematically carried out to reduce the snail and slug population. Lead arsenate would produce a more direct result but small plants would be lost in the process.

Sprays and dusts containing other copper compounds (copper oxychloride, copper carbonate, etc.), also possess snail-killing and repellent properties, and have been used with success on such crops as cabbages and cauliflowers. It is not considered, however, that these materials would have the persistence of Bordeaux mixture-white oil and their chief use might, therefore, be for direct control and "knockdown" of snails and slugs actually feeding on plants, rather than to obtain a lasting residual effect.

RECENT FLOODINGS AND POSSIBLE CUTWORM PLAGUES

IT is anticipated that severe cutworm infestation will be experienced, particularly in coastal and tableland centres, during November and December. Persistent rains last summer and autumn followed by a wet winter and a showery spring have provided abundant weed and herbage growth over a fairly lengthy period, and several pests, including cutworms, are expected to be more than usually troublesome in the early summer.

The fact that many coastal rivers have been flooded, and large areas of farmland inundated, during the past several months, is taken as a clear indication that severe cutworm damage will occur in these areas, at least, as cutworms invariably are troublesome in land recently flooded.

In years of cutworm outbreak, field crops, as well as vegetables, are infested; and should the expected outbreak eventuate, young stands of maize, broom millet, sorghum and lucerne will be affected.

Control.

Poison Bran Baits.

Baits for cutworms may be prepared by mixing 1 lb. of Paris green, or ½ lb. 20 per cent. benzene hexachloride dust, with

24 lb. of bran, and then making into a mash with 2½ gallons of water. The bait should be distributed late in the afternoon by broadcasting it over the whole area or spreading it along the rows of infested plants. Cutworms breed in weeds, and where weed-infested ground has been turned over just before being sown, crop damage may be expected. In flooded ground, cutworm moths are attracted by young weed growth, and lay vast numbers of eggs, with the result that cutworm caterpillars usually are present in plague proportions by the time the land is ready for cropping. Thus, as a general rule, such areas should be baited before vegetables such as cabbages and tomatoes are transplanted, or before seed-sown crops appear above ground.

DDT Sprays and Dusts.

Dusting or spraying crops with DDT will also control cutworms, and in many instances may be preferred to the baiting method.

For dusting, either 15 lb. of 5 per cent. dust, or 30 lb. of 2 per cent. dust, will be required per acre, while for spraying about 100 gallons of spray containing either 2 lb. of 50 per cent. dispersible powder, or ½ gallon of 20 per cent. emulsion, will be required.

In the absence of the ordinary dusting and spraying equipment, a method of applying DDT which suggests itself as being likely to yield good results, is to topdress with DDT mixed with superphosphate. For one acre, 1½ lb. of dispersible DDT powder, or 15 lb. of 5 per cent. powder, should be mixed with sufficient superphosphate (usually 90 lb.) to cover the acre and applied through the ordinary grain drill or fertiliser spreader. The fertiliser runs of the drill should either be removed or allowed to hang loose so as to secure an even spread.

Other Seasonal Pests.

Other pests which may prove troublesome, in view of the unusually wet year and abundant weed growth, include weed web-moth and Rutherglen bug. The weed web-moth caterpillar infests lucerne and pastures, and it is expected that DDT dusting or spraying as recommended for cutworms will prove effective. For Rutherglen bug control, DDT in the emulsion form should be used at the rate of 4 fluid oz. of a 20 per cent. concentrate to 5 gallons of water.

Ernest Field Memorial Prize.

At Wagga Agricultural College.

Mrs. L. BOWEN, of Wagga, the Farmers and Settlers' Association and the "Land" Newspaper Company have provided a sum of £300 to be held in trust by the Farmers and Settlers' Association, for the purpose of providing an annual prize at Wagga Agricultural College, as a memorial to the late Ernest Field. Mrs. Bowen is a daughter of Mr. Field.

This prize will be for the student showing the greatest proficiency in practical agriculture at the Wagga College final-year examinations.

It will be open to all students who are or whose parents are members of the Farmers and Settlers' Association or subscribers to the "Land" newspaper.

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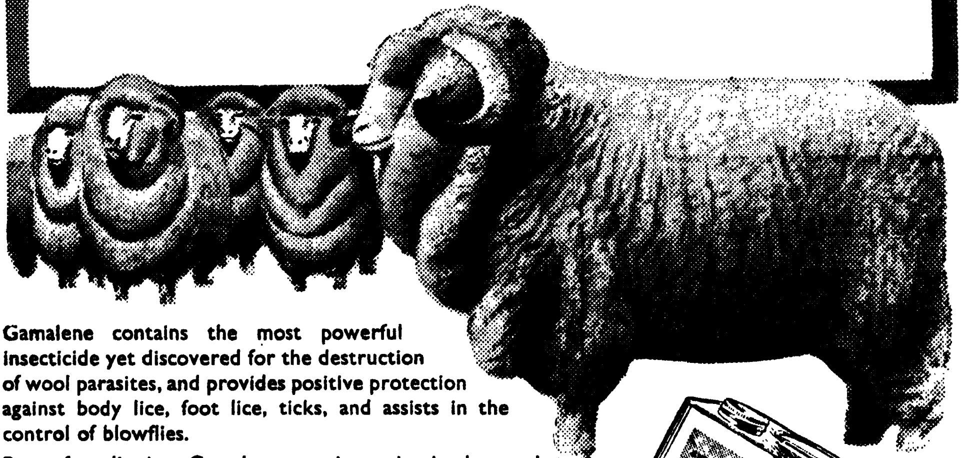

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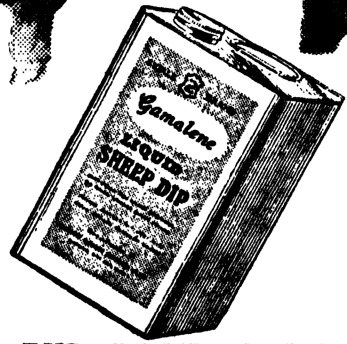

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Comparison of

MANCHESTER OPERATION WITH MULES OPERATION MODIFICATIONS

In Prevention of Flystrike in Sheep

F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officer.

THE following report of results of experiments conducted under the directions of the Department of Agriculture of New South Wales was prepared by Mr. F. H. W. Morley, B.V.Sc., H.D.A., Veterinary Officer of the Department, and is authorised for publication in the "Agricultural Gazette" of the Department.

The spectacular decrease in incidence of crutch strike in sheep brought about by the modified Mules operation has tended to overshadow alternative methods of prevention of flystrike. However, our attention has been attracted to an extremely effective method of control, discovered by Mr. L. L. Manchester,* B.V.Sc., of Charlesville, Queensland. This method consists in the removal of skin around the perineum by chemical means. The edges of the treated area draw together to form a linear scar, thus stretching the bare skin around the vulva and below the tail stump. This produces a bare area, somewhat similar to that produced by the modified Mules operation.

Since the skin on the dorsum of the tail is also treated by the Manchester operation, it is probable that this operation would be more effective than the modified Mules operation, in preventing tail strikes. From preliminary observations made on properties where Manchester operation or modified Mules operation was being practised, it appeared that this effect might be of considerable importance, especially where tails were docked short (definition of Graham, Johnstone, and Riches, 1947), and during severe "fly waves." However, it should be possible to produce a similar effect on the tail by surgical removal of the skin, and this was demonstrated by Graham and Johnstone (1947).

Accordingly, an experiment was undertaken to compare the effectiveness of the Manchester operation, the modified Mules operation, and the modified Mules with tail operation, in preventing flystrike, in groups with tails docked short and medium-long.

In the experiment there were six treated groups, viz.:—

(*a*) Manchester operation—short tail.

(*b*) Manchester operation—medium-long tail.

(*c*) Mules operation—short tail.

(*d*) Mules operation—medium-long tail.

(*e*) Mules operation plus tail operation —short tail.

(*f*) Mules operation plus tail operation —medium-long tail.

In addition, a control group of untreated sheep with short and medium-long tails was observed.

Materials.

Sheep used were drawn from two lots, this being necessary for sufficient numbers. As all sheep were medium-long tailed, some of the younger group were docked further when about twelve months of age, so as to make the tails short. The two groups were twenty months and sixteen months old at the time of treatment.

* The Manchester method for the prevention of blowfly strike is the subject of a patent under the Patents Act, 1903-35, Pat. No. 107994, Patents Office, Canberra, and the use of the method without Mr. Manchester's consent would be an infringement of his patent rights.

Methods.

Selection of Groups.—All sheep were classified into A (plain), B (medium), and C (wrinkly) groups (Seddon, Belschner and Mulhearn, 1931), since wrinkliness has been repeatedly shown to be a predisposing cause of flystrike. Then short-tailed groups were randomised into three groups of 97 and a control group of 47 ewes. Medium-long tailed sheep were then randomised into three groups of 97 and a control group of 50 ewes. Treatments were then decided by lot.

Fig. 1.—Manchester Operation Just Completed.
Note "cradle" for restraint of sheep.
[*Photo.: N. Graham.*

Sheep were full crutched two to three days before treatment.

All sheep were double-tagged for identification and group-branded. Methods of measurement of various characters are described under the appropriate sections.

Treatments.

(i) MANCHESTER OPERATION. — This operation was carried out by J. McKay, Esq., of Kulkine, Trangie, a grazier with considerable experience in using the method. The operation was applied by swabbing methylated spirits containing a dye as an indicator over an area 1-2 inches wide adjoining the bare area around the vulva, and over the dorsum of the tail. Another operator then swabbed the chemical, containing another dye, over the same area, rubbing until the wool over the area commenced to disintegrate. With two men operating, about 50 sheep per hour were treated. Suitable protective clothing was worn, and great care exercised in handling the chemicals.

(ii) MULES OPERATION.—This operation was carried out by N. P. H. Graham, Esq., B.V.Sc., of the C.S.I.R. as described by Graham, Riches and Johnstone (1941) experiment 2.

(iii) TAIL OPERATION.—This operation was carried out by Mr. Graham as described by Graham and Johnstone (1947).

Results.

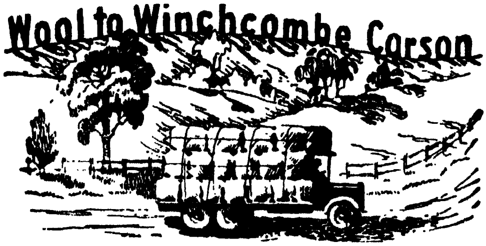
Immediate Effects of the Operation.

(*a*) MULES OPERATION.—As usual after this operation, sheep showed no signs of pain or irritation, except for stiffness in gait, lasting about two days. The groups treated by the tail operation in addition showed no difference in this respect.

(*b*) MANCHESTER OPERATION.—Treated sheep showed no sign of pain, but exhibited similar stiffness in gait to Mulesed sheep. A number of sheep were observed biting the treated area, five days after treatment.

Fig. 2.—Manchester Operation, Six Weeks After Treatment.
Scar lifted.

As it was considered advisable to avoid handling these sheep, they were not inspected closely for three weeks after treatment. Paddock inspection seemed to indicate that



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Manchester sheep were very weak and had lost considerable condition. This comment was made independently by several observers.

Effect on Body Weight.—To avoid excessive handling, sheep were not weighed until 22nd January, five weeks after treatment. At this stage there were no significant weight differences, except in the case of the medium-long tail Manchester group, the mean weight of which was 8 per cent. less than other groups. As the sheep were not weighed before treatment it is not possible to say whether this difference was due to weight loss. Since groups were randomised samples, probably this does represent a weight loss.

DEATHS.—Apart from these immediate effects from treatment, two sheep from the short-tail Manchester group are known to have died as a result of the operation, one on 7th January, eighteen days after treatment, and on 14th January a further death in this group was noted. On 22nd January, one of the medium-long tail Manchester group was severely flystruck under the scab, and subsequently developed a severe arthritis in the right hock, so that it had to be carefully treated in order to save its life.

Fig. 3.—Result of Manchester Operation on Short-tail Sheep.
[*Photo.: R. Meaker.*

During this period, blowflies were not active, but the bush flies (*Musca vetustissima*) were active, worrying considerably sheep treated by Manchester operation.

Fig. 4.—Result of Manchester Operation on Medium-long-tail Sheep.
[*Photo.: R. Meaker.*

Sheep treated surgically (modified Mules operation) showed no adverse effects from the operation, and there was no indication of infection, delayed healing, or fly worry.

Period Required for Healing.

Where possible, sheep were inspected at weekly intervals, from three weeks after treatment. After ten weeks this inspection ceased, due to lambing. Wounds were examined, and scored according to degree of healing by J. N. Wood, Esq., Livestock Officer.

The following method of scoring was used:—

	Mules Operation Groups.	Manchester Groups.
Grade 1	Properly healed ...	Properly healed.
1	Almost properly healed	Almost properly healed.
2	Very clean wound ...	Very clean wound.
2	Clean wound	Clean wound.
2	Moderately clean wound	Scab lifted; infected.
3	Slightly infected wound	Scab lifting; clean.
3	Badly infected wound ...	Scab lifting; infected.
3	....	Scab lifting; bad infection.
4	....	Firm scab.

Inspection of Table 1 indicates that healing in all surgically-treated groups was rapid, and not complicated by infection. The process was completed in five weeks in all groups.

TABLE 1.—MEAN SCORE FOR HEALING IN TREATED GROUPS.
(1·0 = Fully healed.)

	Time in Weeks.							
	3	4	5	6	7	8	9	10
Mules — Short tail	1·69	1·29	1·01	...	...	...	...	...
Mules—Medium-long tail ...	1·76	1·28	1·02	...	...	...	...	...
Mules and tail—Short tail ...	1·93	1·44	1·01	...	...	...	...	...
Mules and tail—Medium-long tail	1·70	1·54	1·05	...	...	...	...	...
Manchester — Short tail ...	2·24	2·08	1·92	1·77	1·42	...	1·15	1·12
Manchester — Medium-long tail	3·03	2·38	2·18	1·84	1·51	...	1·17	1·12

On the other hand, in Manchestered sheep, the process was retarded, so that even after eleven weeks, healing was still incomplete. As the group was commencing to lamb at this stage, these observations had to be discontinued, but one case was observed five months after treatment, with an infected pocket, and two other cases were observed eight months after treatment, both with infected wounds.

Although the majority of Manchester wounds were healed after seven weeks, infection tended to delay healing in a number of cases, for a period of over ten weeks.

The course of events in sheep treated by Manchester operation is that the skin on the treated area forms a hard scab. This commences to lift in about two weeks, and in the short-tailed groups, the majority of scabs have fallen off after three weeks, leaving a large granulating wound. In the medium-long tailed groups, this process appeared to be delayed about two weeks, and in two cases the scab did not drop off for six weeks. The granulating wound healed by cicatricial contraction, the edges drawing together to form a linear scar. In a number of cases a raw, infected portion of the wound would remain unhealed for a considerable period. In numerous cases, pockets of pus formed under the scab and in the granulating wound, and these were subject to flystrike. Seven to eight weeks were required for complete healing in the majority of cases, but a high proportion took considerably longer.

Obviously the surgical wounds healed very much more rapidly than wounds produced by chemical means, and this constitutes a very great advantage in favour of the Mules operation. Had conditions favourable to flystrike developed, probably a large proportion of unhealed wounds would have been struck. This type of situation has been observed on a property where about 90 per cent. of sheep were struck under the scab, resulting in considerable loss of condition, and about 10 per cent. mortality.

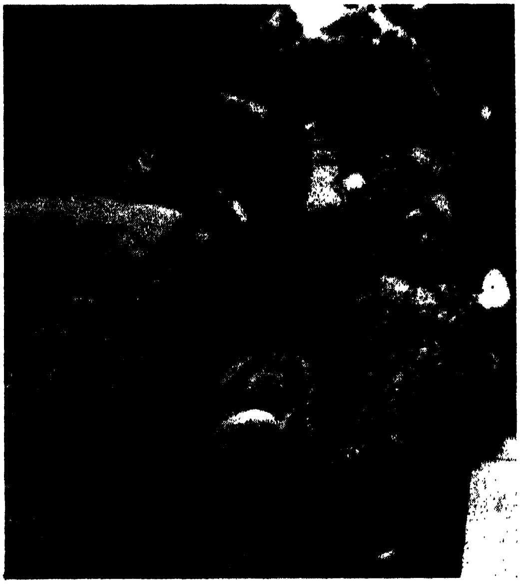

Fig. 5.—Result of Mules Plus Tail Operation.
[Photo.: R. Meaker.

Incidence of Flystrikes in Wounds.

During the period before wounds were healed, there were no strikes recorded in surgically treated groups or in control sheep. A number of strikes were noticed beneath scabs in sheep treated by the Manchester method, but these were only recorded where it was considered necessary to dress them, believing that a number of these strikes would heal unaided, and thus would not be important in practice.

Sixteen strikes were observed in the Manchester short-tail group, which were classed as having extended from wounds.

Nine strikes were similarly observed in the Manchester medium-long tail group.

It is probable that the majority of strikes observed in the autumn of 1947 in these groups were extensions from unhealed wounds. Because of the tissue damage, exudation, and inflammation caused by the strike, the actual wound would not be observed. This point is discussed further in a later section.

Effect on Pregnant Ewes.

Ewes had been mated about two months prior to treatment. Although a poor lambing was expected, and obtained, none of the treated groups differed significantly in this respect from the untreated sheep. It seems, therefore, that no treatment had any harmful effect on ewes about two months in lamb.

Effect of Treatment on Fertility.

These same sheep were mated on 25th September, 1947, for six weeks; the percentage of lambs marked in April, 1948, was 78. No group showed any significant difference in proportion of wet and dry ewes. It seems, therefore, that claims that the Mules operation facilitates mating (by removing wrinkles around the vulva) and therefore results in higher lambing percentages, are not justified.

Effect of Treatment on Size of Bare Area Around Vulva.

Size of bare area was measured in August, 1947, off shears—eight and a half months after treatment. Two measurements were taken, with the sheep standing in a race, as follows:—

1. *Horizontal.*—The width of the bare area, level with the base of the tip of the vulva.

2. *Vertical.*—The measurement from the base of the top of the vulva to the edge of the bare skin vertically below.

In addition the distribution of wool-bearing skin on the tail was scored, according to the following scale:—

Score 1.—Wool-bearing skin well on to ventral surface of tail.

Score 2.—Wool-bearing skin covering fully the sides of the tail.

Score 3.—Woolbearing skin half covering the sides of the tail.

Score 4.—Bare skin covering the sides of the tail.

Score 5.—Bare skin projecting well on to dorsum of the tail.

Three scores were made for each tail—for the left side, tip and right side.

Table 2 gives mean horizontal measurements (for the various groups) and Table 3 the mean vertical measurements of bare area.

TABLE 2.—MEAN HORIZONTAL MEASUREMENTS OF BARE AREA.

Crutch Class.	Treatment.						Mean of Treated Groups.	Control Group.
	Manchester.		Mules.		Mules Plus Tail.			
	Short.	M.L.	Short.	M.L.	Short.	M.L.		
A	3·05	2·95	2·56	2·57	2·58	2·68	2·74	1·06
B	3·14	3·01	2·64	2·41	2·43	2·48	2·69	1·12
C	2·95	3·02	2·46	2·17	2·49	2·41	2·58	1·10
Total ...	3·07	3·00	2·56	2·40	2·48	2·51	2·68	1·11

TABLE 3.—MEAN VERTICAL MEASUREMENTS OF BARE AREA.

Crutch Class.	Treatment.						Mean of Treated Groups.	Control Group.
	Manchester.		Mules.		Mules Plus Tail.			
	Short.	M.L.	Short.	M.L.	Short.	M.L.		
A	1·25	1·21	0·79	0·83	0·72	0·82	0·94	0·54
B	1·08	1·13	0·71	0·72	0·72	0·72	0·85	0·60
C	1·06	1·19	0·62	0·69	0·59	0·75	0·82	0·78
Total ...	1·14	1·16	0·71	0·73	0·69	0·75	0·87	0·60

It is apparent that the Manchester operation has produced greater stretching of the bare area than Mules operation. This is most marked in the vertical measurements, where Mulesed groups do not differ greatly from control groups, but the Manchester groups show an increase of approximately 0.5 inches.

From this result it might be expected that a greater degree of prevention might be achieved by the Manchester operation than by other treatments as used in this case. Actually, from the figures on flystrikes, and from other data on the Mules operation, it seems probable that the amount of stretching produced by the Mules operation is sufficient for prevention of flystrike, so that the increase in area treated may not be warranted.

It is of interest to note that the bare areas were slightly larger in plain than in wrinkled sheep, thus indicating that a slightly better result might be obtained from plain sheep. This might be due to the fact that plain sheep are much easier to treat, and therefore treatment is likely to be more efficient, and also to the possible "drawing in" effect of the wound being expanded on loose skin in C class sheep, rather than in stretching the bare area.

(*To be continued.*)

Stock Feed Competitions Will Replace Fodder Conservation Competitions in 1950.

IN 1950, stock feed competitions which will give points for fodder conservation, pasture improvement and management, grazing and fodder crops, condition of stock, and provision of water supplies and shelter trees, are to replace the fodder conservation competitions conducted for the past twenty-three years by the Royal Agricultural Society.

For some time, discussions have been taking place between the Royal Agricultural Society and the Department, in regard to the form of competition to replace the fodder conservation competitions. A satisfactory scale of points has now been drawn up for judging next year's stock feed competitions.

Local competitions in 1950 will be conducted by country agricultural societies, while the Royal Agricultural Society will conduct championship competitions on the south coast and in southern districts only. In these districts the Royal Agricultural Society will also hold field days in conjunction with the judging.

In 1951 the Royal Agricultural Society will conduct championships on the central coast and in central-western districts, and in 1952 on the north coast and in north-western districts.

Prize money totalling £100 has been allocated by the Society for each divisional championship.

Beware of That Bull! He Can't Be Trusted.

IT is obvious that many Australian farmers have grown too lax in handling and controlling their bulls. Recent reports of bulls attacking and goring farmers should provide timely warning of the ever-present dangers involved in handling these animals.

No bull can ever be trusted, and the only reasonably safe bull is the one behind a stout fence. Even then there is still an element of risk which can only be lessened by careful and knowledgeable handling.

The apparent docility of so many bulls is probably the biggest danger point, in that it is so often taken for granted. A single unguarded moment is all a bull needs to launch an attack which may become a tragedy.

By far the greatest number of attacks on humans result from a bull being allowed to roam with the herd. Milking time, then, becomes a regular period of danger.

When the cows are coming into the yards or the bails, the general bustle and the presence of so many other animals make it only too easy for attention to be distracted from the bull. He may be forgotten, but he is still there!

The only relatively safe way of keeping a bull is to house him in a secure, well-fenced yard and to take the cows to him as the need arises. For closer handling, fit him with a nose ring so that he can be led or handled with the aid of a staff.

Build your shed and yard so that the bull may be caught easily if necessary—and make ample provision for safety exits in case the need arises for a quick getaway.

These exits should be built with round posts, the openings being from 10 to 12 inches wide, depending on the build of the persons likely to be using them.—W. J. B. MURPHY, Special Livestock Officer.

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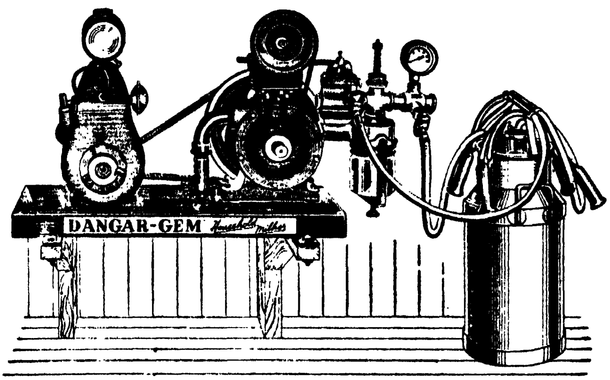

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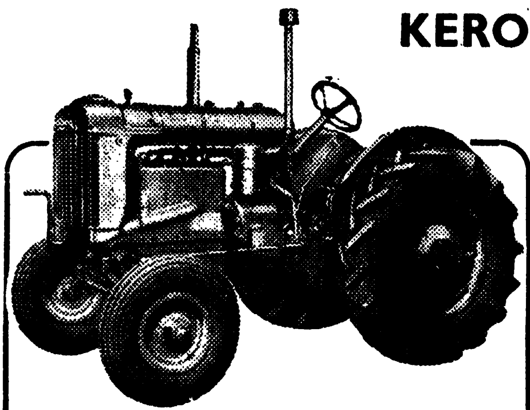

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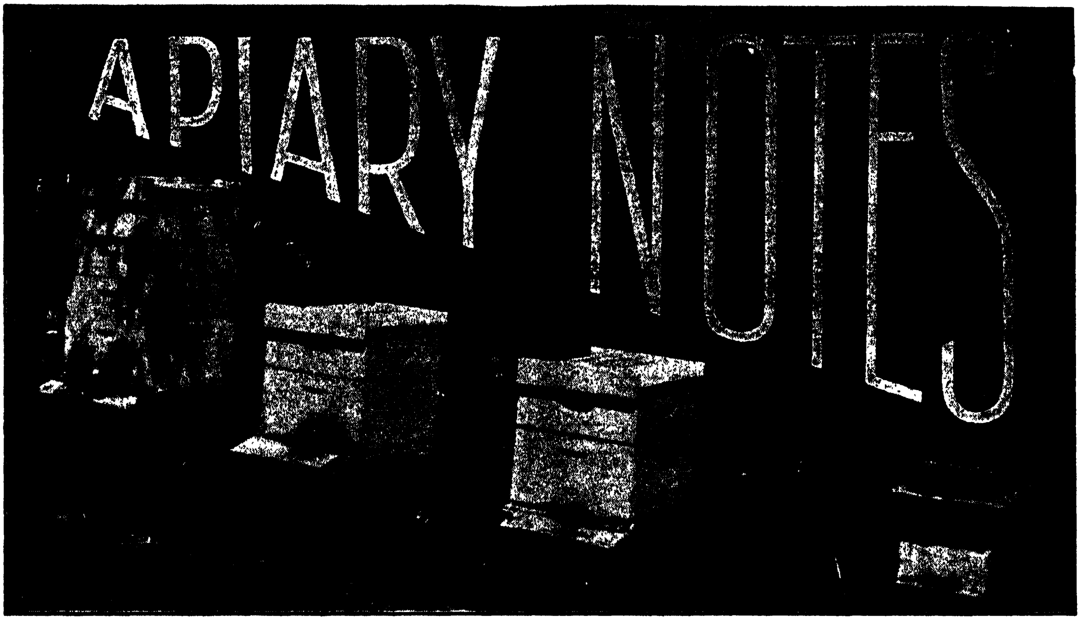


QUEEN BEE RAISING

N. A. CUTTS, Livestock Officer (Apiculture).

WITH the prospect of a light honey flow this season, an opportunity is given beekeepers to replace queens in colonies which have been heavily worked maintaining the field force during the past season of record honey production. The best queens are raised under conditions which give a light honey flow coupled with a plentiful supply of pollen. These conditions should be present during spring and summer months when species of ground flora such as Capeweed, flatweed, and Paterson's curse, etc., are in flower.

Numerous requests have been made to the Department for demonstrations in queen-rearing. The following description of a procedure which should result in the raising of good quality queens should therefore be of interest to many apiarists.

Selection of Breeding Stock.

As it is necessary to have virile young queens at the head of every colony in the apiary, it is important that they be raised from the best queen in the apiary.

When selecting a queen from which to breed, first consideration is given to the purity of the strain of bee, as the characteristics of the breeding queen are transmitted to the royal progeny. The queen must, therefore, be a purebred. If she is not, there will be wide variation in the bees raised from her. Good egg-laying capacity of the queen, high honey production, and a non-swarming tendency of her progeny are very important charactertistics required in a breeding queen, while others are quiet action of the queen and her worker progeny on the combs when being handled, good wintering qualifications (some strains winter better than others) and, perhaps, the size of bees. Large bees mean larger loads of nectar, so that the apiarist should avoid breeding from a queen whose progeny is on the small side.

The breeding queen may be selected in the apiary, or purchased from a reliable queen breeder.

Cell Starting Colony.

To commence queen rearing prepare a three-frame nucleus box with a wire gauze bottom for ventilation, a close fitting lid and

no entrance. It is advisable to have 1 inch clearance between the bottom of the frames and the wire gauze to prevent crushing any bees. Into this box place a comb of fresh pollen on one side and a comb of unsealed honey on the other; the space in between is for the bar of queen cells.

Then go to a fairly populous hive containing plenty of unsealed brood. Find the queen, place her to one side, and select three combs of unsealed brood well covered with young bees. Remove one of the combs from the nucleus box and shake in the three combs of bees, quickly replacing the lid.

Fig. 1.—A Frame with Prepared Cell Cups.

This procedure is known as "borrowing" the bees and is called the Swathmore or swarm-box method.

The box of bees is "borrowed" during the morning and placed in a shady position or darkened room for a few hours, usually until the afternoon, to allow the bees time to discover that they are queenless. Young bees from unsealed brood are selected because they contain plenty of chyle food, which will be fed to the "royal" bee larvae, and they are well provided with pollen and honey for the production of a further and ample supply of this vitamin-rich food.

After 4 to 6 six hours have elapsed the bar of queen cells containing the transferred larvae is placed in the nucleus box. To do this give the box a sharp bump on the ground, lift the lid and quickly drop in the bar of cells; very few bees will escape. Replace the box in the shade until next day.

Preparing the Queen Cell Cups.

Artificial queen cell cups are made by the use of a cell-forming stick. The point of the stick is dipped in water, wiped with a damp cloth to remove any excess moisture, and then dipped into melted beeswax three or four times to a depth of 3/8 to 1/2 inch, allowing time between each immersion for each layer of wax to cool. When fully formed, immerse the stick in water again to harden the wax, and then remove the cell cup. For best results the wax should be neither too hot nor too cold.

Repeat the process till a sufficient number of cups are made.

Some beekeepers prefer to obtain a number of embryo queen cell cups found on the combs in the hive instead of making them.

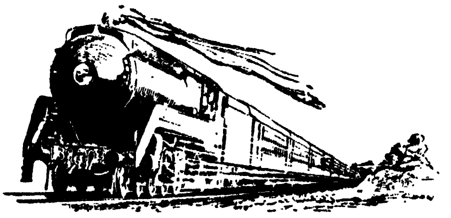
A number of cell holders are made in the form of little blocks of wood or wax about 1/2 inch in diameter and height, with a slight depression to receive the cell cups. These are firmly attached to the bar of the cell holding frame, and the cell cups pressed into them.

Transferring the Larvae.

During the warm part of the afternoon after making up the cell-starting colony, the transferring of the young larvae into the cell cups is carried out.

Obtain a comb containing a number of young larvae upwards of two days old from the hive of the selected breeding queen. Pare down the walls of the cells with a sharp knife so as to expose the larvae but not low enough to injure them. Then remove the larvae with the point of the transferring needle. The point of the needle is moistened and placed under the backs of the grubs and an endeavour made to obtain as much of the milky fluid as possible. The larvae are lifted out and gently placed in cell cups, care being taken not to damage them in any way.

A transferring needle can be made by paring down the point of a feather quill, or a splinter of soft pine wood.



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S. R. NICHOLAS,
Secretary for Railways.

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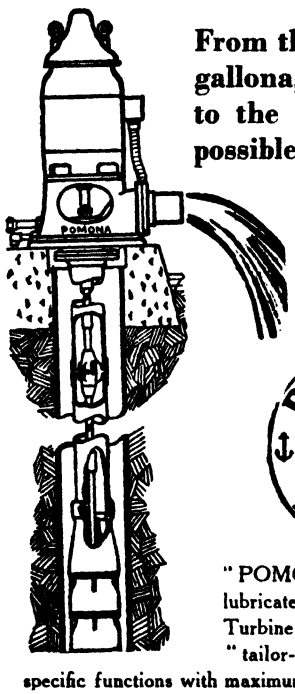

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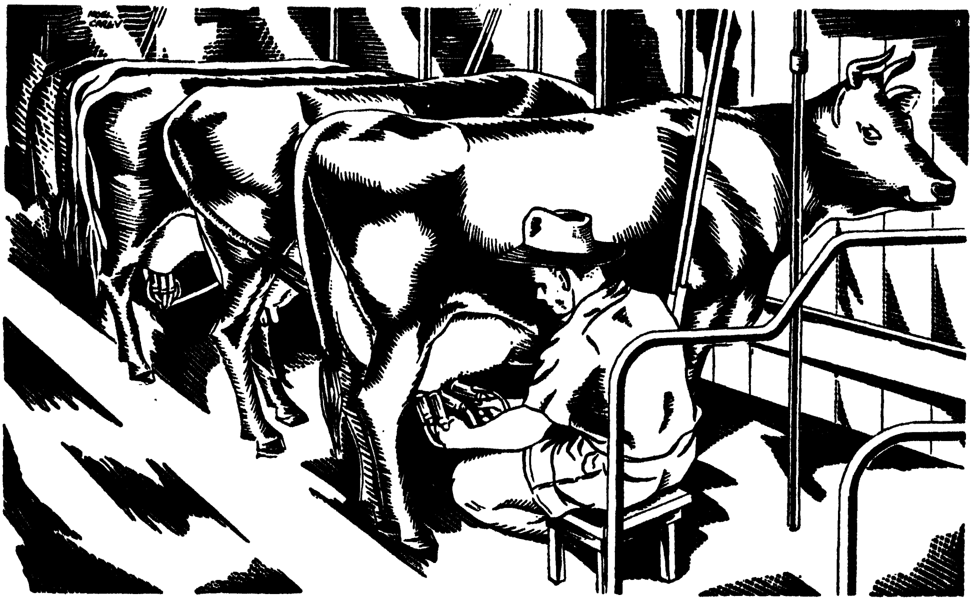

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The transferring or grafting operation should be done as quickly as possible so as not to expose the young larvae any longer than necessary, and the bar of cells placed in the cell-starting colony until the next day.

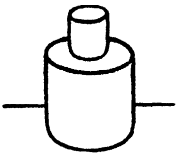

Fig. 2.—Cell Cup Reversed Ready for Transfer of Larva.

Cell Feeding Colony.

The same day as the cell-starting colony is prepared, select a double-storey hive which contains brood in both boxes and is in a thriving populous condition. This is to be the cell feeding colony.

Find the queen and confine her to the bottom box by placing a queen excluder between the brood box and super. Rearrange the brood so that there are three or more combs containing a large proportion of unsealed brood above the excluder. The remainder of the combs should contain honey and some pollen. Place a division board feeder in the super also, and give a pint of warm sugar syrup. Even though honey is coming in, it is advisable to feed the cell feeding colony while the cells are being developed.

The day after grafting is carried out, the bar of cells is taken from the cell-starting box and placed between the combs of unsealed brood in the feeding colony, along with the bees which adhere to the frame. The remainder of the bees in the nucleus box are returned to the hive from which they were "borrowed" by shaking in front of the hive and allowed to run in.

While changing over the cells from the starting to feeding colony, the number of cells accepted can be noted. Those which are accepted by the bees will be partly drawn down and well supplied with the milky fluid known as "royal jelly" or chyle food.

In selecting both cell-starting and feeding colonies, choose hives in which the larvae are well fed, as some hives have a tendency to feed their young better than others. This will ensure the young queens being well fed also. For best results no more than sixteen to eighteen cells should be given to a feeding colony at one time.

Mating Nuclei.

Ten days after grafting the cells are "ripe," and are ready for distribution, one to each nucleus hive. The nucleus colonies should be made queenless overnight, before the cells are due to be distributed, otherwise the cells may not be given sufficient attention by the bees.

If no nucleus colonies are on hand they must be made up two to three days before the cells are ripe. Make them up by placing in each box one comb of honey, a comb of brood well covered with bees, a "shake" of bees from another comb and an empty comb or frame of foundation. The bees are shut up in these boxes for two or three days to forget their location—or better still, they are removed to a site about three miles away.

The ripe cells must be handled carefully as the immature queen is rather delicate. She must not be injured, or she may die in the cell or emerge with deformed wings.

Fig. 3.—Queen Cell Being Placed on a Brood Comb.

Ten to twelve days after emerging from the cell the queens should commence to lay; a few days later they are ready for introduction to the colonies to be requeened, either by introducing cage or by uniting the whole nucleus.

POULTRY NOTES

MANAGING POULTRY IN CITRUS ORCHARDS

To Control Weeds and Build Fertility

J. H. GULLIFORD,
Livestock Officer
(Poultry).

THE running of poultry in citrus orchards is a system that has become very popular during the past few years, and considerable benefit has been shown in improved tree vigour, even after this short period.

Whilst stocking the orchard with poultry can overcome to a large extent many of the orchardist's problems, it should not be considered a short cut to successful orcharding. The daily attention required by the poultry may prove a tie; although necessary it should be reduced to a minimum so as not to interfere unduly with regular orchard practices. The poultry themselves can and should be a source of additional revenue. However, the orchardist should not attempt to become a poultry farmer, the birds being kept only for their usefulness in the orchard.

The principal benefit is derived from weed control by the poultry—thus eliminating cultivation with its continual destruction of tree roots and conserving soil moisture which, particularly during dry weather, would be partially lost through weed growth. The poultry manure is a valuable adjunct to the fertilisers required, but with correct stocking rates will not fully meet the trees' nutrient requirements.

Laying-out the Orchard for Poultry.

In laying-out the orchard for poultry the object is to obtain even distribution of the birds over the whole area. This is achieved, firstly by correct placement of the houses, and secondly, by management of the birds themselves.

It is not desirable to divide the orchard up with wire-netting fences, and for this reason the houses should be placed not less than two chains apart in order to prevent the birds drifting from one house to another.

The size of the house will depend on size and shape of the orchard and the number of birds to be kept per acre. As a general rule houses to hold 50 to 100 birds are the most satisfactory.

Suitable sizes for houses are shown in accompanying table:

No. of Birds.	Length.	Width.	Height at Front.	Height at Back.	No. of Perches.
	Feet.	Feet.	Feet.	Feet.	
50 ...	15	7	6	5	2
75 ...	15	8	6	5	3
100 ...	20	8	6	5	3

Houses should preferably face north, if possible, but any direction from north to north-east is satisfactory. Concrete floors

are to be preferred, but on steep slopes a good hardwood floor will be cheaper and easier to construct.

No hard and fast rule can be laid down as to the number of birds to be kept per acre, the object should be to reduce the number of birds to the minimum required to maintain weed control. Where a heavy

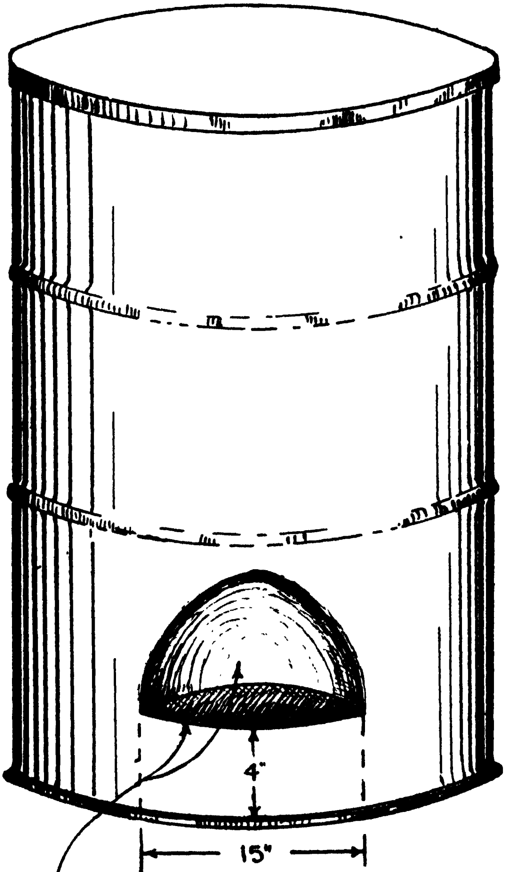

Fig. 1.—Mash Hopper Made from 44-gallon Drum.

infestation of couch or similar vigorous-growing perennial grass is present it may be necessary to stock fairly heavily in order to kill the grass out, after which the numbers should be reduced. As a general rule it would appear that 75 to 100 birds per acre will maintain weed control in normal seasons on the central coast.

It should be borne in mind that during the rearing season the number of birds on hand is increased by 60 to 70 per cent., and as this period coincides with the marketing of fruit and a busy spraying programme, the fewer the number of birds kept—so long as the object of keeping them is achieved—the better.

Rearing Young Stock.

The young stock should preferably be reared in a separate area, or in a section of the orchard reserved for this purpose. The provision of a brooder house near to the residence is essential for rearing the chickens up to six weeks of age. A wide range of brooders is available. Where electricity is connected the use of electric hover types will be found most labour-saving; however, kerosene-heated types give very satisfactory results but require daily attention to the lamps.

Following the brooding stage the chickens may be taught to roost in weaning pens and then transferred to the orchard, or transferred direct from the brooder and taught to roost in their permanent quarters. Under either of these systems it is necessary to provide sufficient houses through the orchard to accommodate both the young and adult stock. This would mean that roughly one-third of the orchard would not be stocked for a considerable portion of the year.

The alternative is to devote a separate area to rearing the young stock up to laying stage, and then transfer them to their permanent quarters in the orchard. For this purpose colony houses to hold fifty birds each will be required; 500 birds can be raised on an acre of ground.

The latter method is preferred, as the young stock are reared on an area reserved for this purpose only, and do not come into contact with adult birds or infested ground, thus reducing the liability of an outbreak of disease or parasite infestation to a minimum.

Details of the construction of a brooder house, weaning pens and colony houses are contained in leaflets which are obtainable free on application to the Department of Agriculture.

Feeding.

There are several different systems of feeding poultry, but the one most suitable for use in an orchard is an all-mash ration for chickens up to six weeks of age and

a dry mash and grain ration from that age onwards. The feeding of wet mash is not recommended owing to the additional labour involved.

The mash and grain should be fed in separate hoppers, both of which may be left open all the time. Contrary to popular opinion, birds that are accustomed to this system of feeding seldom eat more grain than mash. Rations are based on the assumption that the birds will consume equal parts of mash and grain (by weight), and a check should be made occasionally to see if this is the case. Where more grain is consumed 1 lb. additional meat meal should be added to the mash for each 10 lb. grain consumed in excess of mash.

As very few orchardists will be in a position, owing to lack of irrigation, to supply suitable green feed, it will be necessary to add a vitamin A oil to the mash. Moreover, it is doubtful whether the additional work involved in providing green feed daily is justified, as the addition of vitamin A oil to the mash gives equal results. The addition of lucerne meal to the mash does not entirely take the place of green feed.

Suitable mash and grain hoppers which can be made on the farm from 44-gallon drums are shown in Figs. 1 and 2.

The following rations are being widely used and are giving excellent results:—

	All Mash for Chickens up 6 Weeks Old. lb.	Dry Mash for Birds over 6 Weeks Old. lb.
Wheat meal	30	25
Pollard	22½	42
Bran	15	20
Meat meal (40 per cent. protein)	12	12
Whey powder	5	—
Linseed meal	5	—
Coconut meal	5	—
Lucerne meal	5	—
Fine salt	½	1
		Wheat also to be supplied in hoppers.

Vitamin A oil should be added to both mashes.

The Water Supply.

A constant supply of clean, cool water is essential at all times, and owing to the impossibility, in many cases, of installing a reticulated service, it will be necessary to devise other methods. Where a 500-gallon tank can be attached to each house a ball cock system may be employed. An easily constructed water tank, made for a 44-gallon drum, is illustrated in Fig. 4.

The drum may be filled from a portable tank, the outlet being fitted with a cork while filling. It is necessary that the bungs should fit securely, as the success of the system

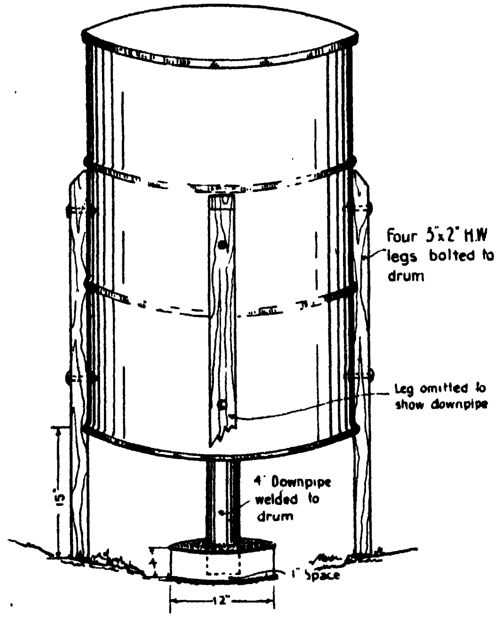

Fig. 2.—Grain Hopper Made from Drum Mounted on Legs.

depends on the drum being airtight. The drum should be kept in the shade of a tree or the house, so that the water does not become sun-heated.

As a guide to the approximate quantity of water required it is estimated that in the summer fifty fowls will consume three to four gallons per day.

Management of the Birds.

When the birds are first placed in their permanent quarters in the orchard they should be confined to a small temporary yard in front of the house for at least a week

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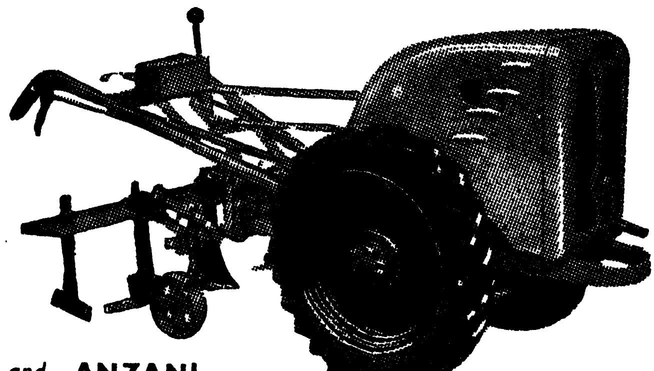

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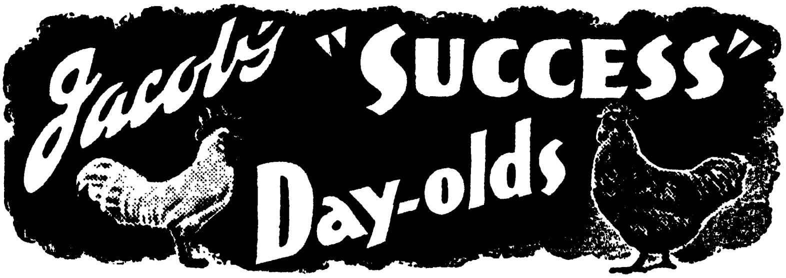

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50	4	5	0	2	5	0	4	0	0	2	3	0	4	2	6	2	4	0
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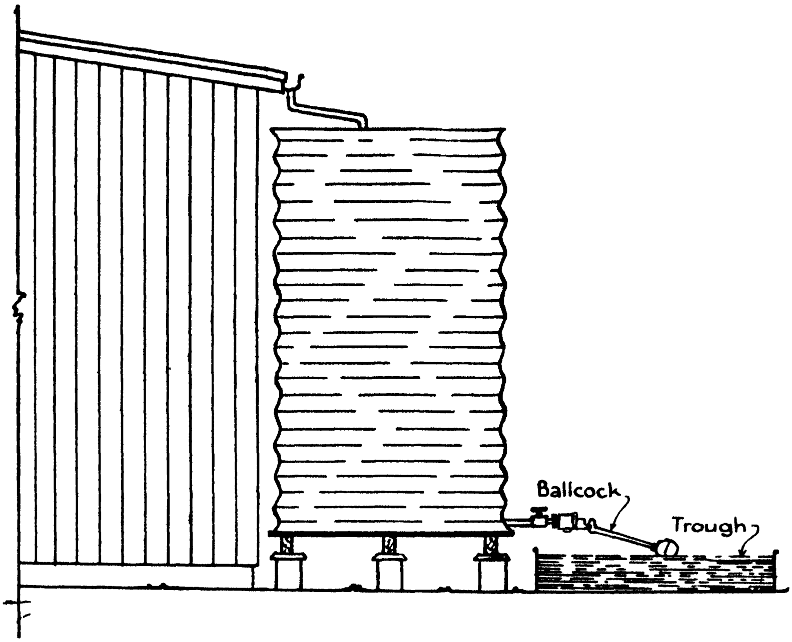

Fig. 3.—Diagram showing Cross-section of 500-gallon Water Tank, Fitted with Ball Cock.

to localise them. Provided the houses are correctly spaced very little drifting from one house to another will occur after this period.

Very little trouble will be experienced with birds laying in the orchard if suitable nests are provided for the pullets well in advance of the time they commence to lay; allow one nest for each five birds.

The mash and grain hoppers should be moved from time to time, thus encouraging the birds to work over the whole area. By moving hoppers the birds can also be concentrated on a particular area, such as a patch of couch grass. It is important that the hoppers be moved only a short distance

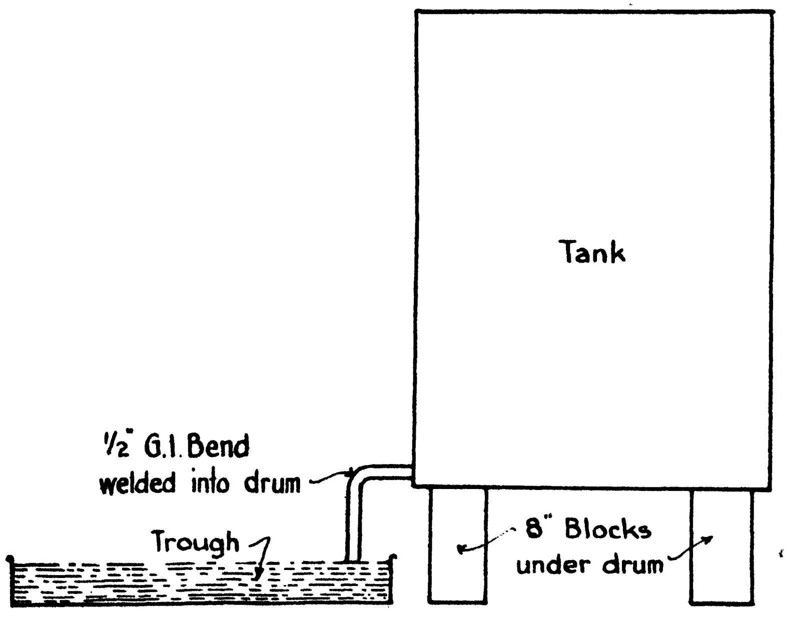

Fig. 4.—Diagram showing Cross-section of Portable Water Tank.

at a time, and preferably during the early morning, when the majority of the birds are near the hoppers.

Hens or Cockerels?

Either hens or cockerels may be run in the orchard, and as a guide to which will suit the individual orchardist's particular requirements the following comparison of the two should be considered.

Hens will cover the orchard throughout the whole year, thus maintaining complete weed control. Where a flock of 1,000 hens is kept it will be necessary to raise about 600 pullets each year. The best time to procure day-old pullets for egg production is from early July to mid-August. Eggs should be collected twice daily.

Where it is proposed to run cockerels it should be borne in mind that the most profitable time to market them is from three to four months old. As only young stock will be kept it will be necessary to run at least twice as many cockerels as hens over the same area, necessitating double the number of houses. Cockerels can only be reared over a limited period of the year, which would mean that during the late autumn and winter other means of weed control would have to be resorted to. Day-old cockerels could be obtained from early May until the first week in September. Those hatched in early May would be of very little value in the orchard before the end of June, whilst those hatched in early September would be fit for market in February, taking longer to reach a prime marketable age than those hatched earlier.

The following all-mash ration is suitable for rearing cockerels from day-old to market age:—

	lb.
Wheatmeal	34
Pollard	20
Bran	15
Ground oats	10
Meatmeal	15
Whey powder	5
Salt	½

Plus vitamin A oil.

Some difficulty may be experienced in obtaining early-hatched cockerels, as the majority of early-hatched chickens are sold as mixed sexes.

Good results have been obtained by purchasing some chickens early as mixed sexes, and a later lot of day-old pullets. The cockerels from the early lot mature quickly and realise high prices; the pullets will commence to lay early, but go through a moult in the following autumn. The later-hatched pullets should not moult, but lay through the period when egg prices are highest.

Breeds.

Undoubtedly the most popular breed for orchard work is the White Leghorn-Australorp cross. This cross retains the activity of the Leghorn, being a good forager, but does not tend to roost in the trees, which is one of the Leghorn's worst faults for orchard work. The cross makes an excellent table bird, and being a layer of tinted eggs, much of the soiled egg problem is overcome. Some broodiness may be experienced, but this is not as bad as with some of the heavy breeds.

Insect Pests of Tobacco—*continued from page 538.*

When treatment with DDT has been completed, crops from then on should be dusted in the shoots with a mixture consisting of 1 lb. of lead arsenate and 24 lb. of pollard to control budworm. An alternative suggestion for controlling budworm is to use a DDT pollard mixture consisting of ¼ lb. 50 per cent. dispersible powder or 2½ lb. of 5 per cent. dust to 24 lb. of pollard.

Acknowledgments.

The writer is indebted to Mr. John Loveridge, District Agronomist, Tenterfield, for his co-operation through the season, and to Messrs. Akhurst and Sons, Ashford, and Mr. B. Poli, Texas, in whose crops pest control demonstrations were conducted, for their assistance.

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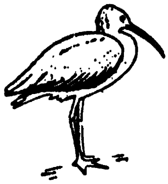

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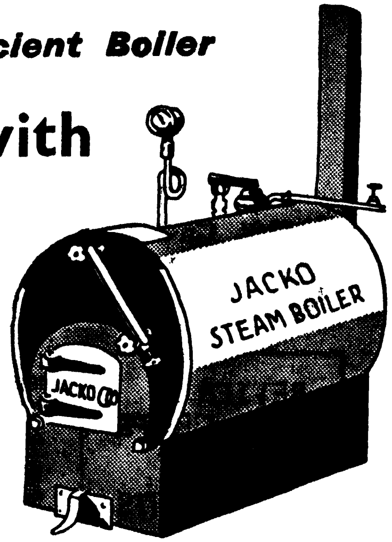

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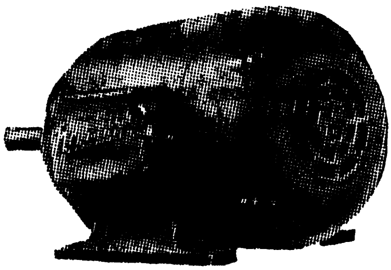

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Tubercle-free Herds

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
athurst Experiment Farm	63	11/7/50
Christian Bros., Novitiate, Mt. St. Joseph, Minto (Ayrshires)	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus) A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jersey and Friesians)	112	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
Limond Bros., Morisset	67	25/7/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	90	15/7/50
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	77	22/8/51
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50
Perry, E. L., Shane's Park, via St. Mary's (Jerseys)	67	31/5/50
Police Boys' Club, Camp Mackay, Kurrajong (Jersey and A.I.S.)	26	1/7/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus)	38	19/8/50
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	25/7/51
Scott, A. W. "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	42	30/5/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	165	1/7/51
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	64	21/5/50
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Andrews, G. M., "Mulla Villa" Grove, Wollombi	56	8/8/50
Australian Missionary College, Cooranbong (Jerseys)	107	19/8/49
Barnardo Farm School, Mowbray Park	48	15/7/50
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colley, A. G., "Heatherbrae," Swanbrook Road, Inverell	30	28/7/51
Coote, B. N., Auburn Vale Road, Inverell	38	28/7/51
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	13	6/6/50
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell	102	16/8/51
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	18	31/5/50
Grant, W. S., "Monkittee," Braidwood	20	2/7/50
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	53	1/6/51
Hart, K. H., Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	71	28/7/50
Koyong School, Moss Vale	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	45	8/7/51
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Callan Park Mental Hospital	48	23/4/50
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, Estate E., "Bannockburn Station," Inverell	64	8/7/50
McGrath, B. J., Clyde Rd., Braidwood	31	13/8/49
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B., "Mount View," Cessnock	93	18/7/51
Marist Bros. College, Campbelltown	70	18/2/50
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	27	30/8/50
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Pyne, H. W., Cedar Creek, via Millfield	26	16/8/50
Rolfe, A. E., "Avon Dale," Inverell	23	8/7/50
Rolfe, C. D., "Rose Farm," Inverell	31	17/3/50
St. Ignatius' College, Riverview	24	6/9/49
St. John of God Training Centre, Kendall Grange, Lake Macquarie	10	4/7/51
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead	27	22/8/51
State Penitentiary, Long Bay	14	27/11/49

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Stephenson, W. J., "Hill View," Fig Tree ..	60	1/4/50
Sternbeck, P. J., Millfield	32	16/8/50
Tanner, F. C., Dural Rd., Armidale	42	8/10/49
Thompson, K., Yallambi, via Wollombi ...	90	8/8/50
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ..	42	8/10/49
Tombs, R., Harlwood, Armidale	37	/10/49
Tosh, W. K., "Balgownie," Armidale ..	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., "Spring Hills," Camden	61	7/12/49
Waddell, W., "Afton," Oakwood Rd., Inverell	125	8/7/50
Waters, A., Marsh Street, Armidale ... ...,	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	[illegible]5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, "Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Cattle Illegally Inoculated.

With Active Tick Fever Organisms.

THE Department was recently informed that certain New South Wales cattle depastured near the Queensland border and intended for despatch to the cattle tick infested areas in Queensland, had been inoculated with blood containing active tick fever organisms, which had been obtained from a Queensland source.

This action was a direct breach of the New South Wales Stock Diseases Act, which states:

"No person shall inoculate any stock against tick fever, or cause, or permit any stock to be inoculated."

The necessity for strict observance of this clause lies in the possibility of treated cattle entering tick quarantine areas of New South Wales.

If this happened it would be possible for ticks adhering to such animals to become infected with tick fever organisms and through their progeny transmit the disease to other cattle, causing considerable losses.

Hawkesbury Agricultural College Stud Friesians to be Dehorned.

THE stud Friesians at Hawkesbury Agricultural College are to be dehorned in the near future, as a start on the Department's policy that dairy herds should be dehorned.

Up to the present, departmental dairy cattle have not been dehorned, largely because they are studs.

Also, these cattle are often exhibited at agricultural shows, and many people who have purchased stock from departmental studs seemed to prefer the animals with horns intact.

For this reason, bulls intended for outside sale from departmental studs will not be dehorned.—DIVISION OF DAIRYING.

Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	64
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)...	29
Evans, C. A., & Sons, "Bong Bong," Moss Vale	58
Fairbairn & [illegible]P., Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	69
McEachern. H., "Nundi," Tarcutta (Red Poll)...	53
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	39
McSweeney, W. J., "The Rivers," Canowindra (Beef Shorthorns)	52
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road. Quirindi (Herefords)	77
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys) ...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	111
Quickenden, P. W., "The Knoll," Bundanoon (Jerseys)	9
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	52
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	106
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	38
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Sydney Church of England Grammar School, Moss Vale	43
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
Walker, J. R., "Strathdoon," Wolsley Park	67
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	64
Yanco Experiment Farm	54
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Callan Park Mental Hospital	44
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth ...	27
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	31
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	27
Prison Farm, Emu Plains	127
Rydalmere Mental Hospital, Rydalmere	39
Salway, A. E., "Coolagalite," Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Von Nida, F. E., "Strathgarve," Wildes Meadow, via Moss Vale	32

W. L. HINDMARSH, Chief, Division of Animal Industry.

Pullorum-tested Flocks

THE following is a list of flocks which have complied with the Department's Accredited Pullorum-tested Flock Scheme, and which are tested regularly for pullorum disease:—

Name and Address of Owner.	Breeds.
Clucas & Sons, J. E., "Bellevue" Hatchery, Old Northern road, Castle Hill.	Australorps, White Leghorns, Rhode Island Reds.
Hawkesbury Agricultural College, Richmond	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Turkeys.
Juniel, E., Mrs., Kings-road, Ingleburn	White Leghorns, Australorps.
Kennedy, F. J., "Kenwood," Orchard-avenue, Model Farms.	Australorps, White Leghorns.
Phippard, H. L., Bobbin Head road, Turramurra.	Rhode Island Reds, White Leghorns.
Seven Hills Poultry Experiment Farm, Seven Hills.	Australorps, White Leghorns, Chinese Langshans.
Wagga Agricultural College and Experiment Station, Bomen.	Australorps, White Leghorns.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Road, Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Draper, R. E., " Glengar," Capertee.
" Endeavour " Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., " Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Police Boys' Club, Camp Mackay, Kurrajong.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Wagga Agricultural College and Experiment Station.
Walker, J. R. " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Fraser, S. M., "Springvale," R.M.B. 906, Inverell.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Choose Proprietary Dairy Feeds Wisely.

PROPRIETARY feed mixtures are often available to the dairy farmer, but as they vary considerably in food value and price they should be carefully compared from this angle with common feeds which may be available.

Under the Stock Foods and Medicines Act, all bags of feeds must have attached to them a label showing minimum crude protein percentage, minimum crude fat percentage and maximum crude fibre percentage.

The protein percentage is of most importance. If the material has a fairly high content of protein, say, over 20 per cent., it should be regarded as a protein concentrate and compared with other protein concentrates by dividing the cost by the protein percentage.

If it is a fairly well balanced feed, *i.e.*, with 12 to 20 per cent. of protein, the price of the material should be compared with the price of a single feed of similar analysis or a mixture of the same protein content made up with bought feeds. Sometimes it may be found cheaper to buy feeds and make up one's own mixture than to buy a ready-made mixture.

Fibre content should be below 10 per cent.; in general, the lower the fibre content, the better buying is the material. Fat content is not of great importance—a high fat content, however, usually indicates a food with a high food unit value.

The following figures show the composition of some common feeds. An idea of the food value of a proprietary feed may be obtained by noting the common feed, of known food value, to which its analysis most closely compares:—

	Crude Protein.	Crude Fibre.	Crude Fat.	Food Unit Value.
	per cent.	per cent.	per cent.	per cent.
Maize ...	10	1.5	4	78
Wheat ...	9–12	2	1.7	72
Oats ...	11	11	5	63
Bran ...	15	10	5	44
Coconut meal	20	11	6	76
Linseed meal	30	8	6	72

THE AGRICULTURAL GAZETTE FOR NOVEMBER, 1949

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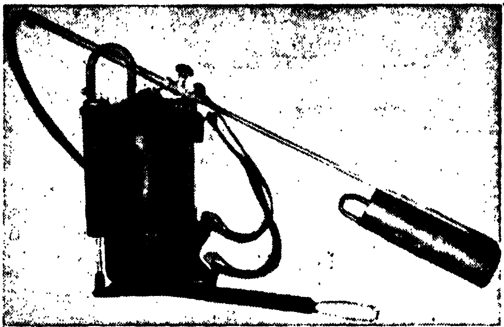

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The Agricultural Gazette

Devaluation and the Farmer

SINCE September, when both Britain and Australia announced that their respective currencies had been devalued in terms of U.S. dollars there has been a vast amount of discussion ranging over all aspects of the subject. In this article, Mr. P. C. Druce, Economics Research Officer, discusses one of the many aspects of devaluation—its more immediate effect on the Australian primary producer.

Devaluation will affect almost all farmers in some small way at least; some it will effect very considerably. Some may be worse off because the Australian pound is now worth less in terms of U.S. dollars than it was formerly, others will almost certainly find their net incomes substantially increased. Farm incomes will be affected in two broad ways. Some incomes will be higher because the prices paid in terms of Australian currency for certain of our exports will rise, in fact have already risen. Some farmers' net incomes will fall because their costs will rise while there will be no increase in their gross receipts.

Higher Incomes from Wheat and Wool.

The wheatgrower and the wool producer will almost certainly benefit substantially—increased returns for wheat and wool are likely to considerably more than offset any increase in costs which may result from devaluation.

(a) Wheat.

The price of wheat sold under the International Wheat Agreement has already been increased substantially. The approximate maximum and minimum prices in Australian currency prior to and following devaluation are shown below.

Year.	Minimum Price.		Maximum Price.	
	Prior to Devaluation.	On Present Exchange Rates.	Prior to Devaluation.	On Present Exchange Rates.
	s. d.	s. d.	s. d.	s. d.
1949-50	8 9	13 5	11 0	16 1
1950-51	8 1½	12 6	11 0	16 1
1951-52	7 6	11 7	11 0	16 1
1952-53	6 11	10 8½	11 0	16 1

Australia is therefore receiving about 5s. per bushel more for I.W.A. wheat than prior to devaluation, while there has also been a substantial increase in the open market price for wheat. Wheatgrowers will therefore receive considerably higher returns for their 1948-49 and 1949-50 wheat than was anticipated three months ago, and, particularly in view of the United States'

dominating position in world wheat trade, wheat prices are likely to remain at permanently higher levels than would have been the case had our currency not been devalued. Wheatgrowers may obtain more direct benefit as a result of devaluation than any other group of rural producers.

(b) Wool.

Following devaluation, wool prices have risen from 5 per cent. to 15 per cent., and while such a rise cannot definitely be attributed to the devaluation of the currency it is probable that it is a direct result of that policy. It is generally considered that not only will the United States buy more wool directly from Australia than prior to September 19th but also that U.S. buyers will be prepared to pay more for Australian wool *in terms of Australian currency* than was formerly the case. This is likely to result in higher and more stable prices for wool at auction, and so wool producers should find that their incomes, if not further increased, will at least not fall to the extent that they might otherwise have done.

Returns for Other Products?

It is unlikely that there will be any significant immediate increase in returns to producers of other agricultural commodities. Most of Australia's exports other than wool are sold to Britain or other countries within the sterling area, many of them under contracts, so there will be no immediate increase in the prices paid. There may, however, later be some upward adjustment of prices, particularly for such commodities as butter, cheese and eggs, as undoubtedly Denmark, and possibly other suppliers will shortly be forced to charge Britain more for these goods; consequently Australian contract prices may later be increased.

There will, however, be some minor exceptions where fairly immediate price increases will result—goods sold to Canada and to other countries which did not depreciate their currencies to the same extent as Australia, will show increased returns, and so we may expect small increases in our earnings, particularly for some processed goods, such as canned fruits, processed milks, and wine, some of which are sold to Canada and other countries whose exchange rates are unaltered. But the quantities of such exports are comparatively small and will have very little effect on the income of the farmer who produces them. The price paid for rabbit skins sold to the United States should also increase.

Farmers' Costs will Increase.

Devaluation will inevitably cause some increase in farm costs, unless taxation policy is modified, as all farmers depend to some extent upon imported materials and equipment. Petrol and other fuel costs will almost certainly rise (if they have not already done so by the time this note appears in print) while most, probably all, imported machinery prices will increase. Even Australian-produced car and tractor prices are likely to show small rises eventually, as the result of devaluation.

The price of U.S. and Canadian tractors, cars and other machinery will of course rise very much more steeply than will English, Australian and most European machinery. But machinery and other equipment from these latter sources is also likely to rise slightly because much of the metal used is imported from "dollar areas," while some few American components are used in the manufacture of tractors and cars produced in this country by U.S. interests.

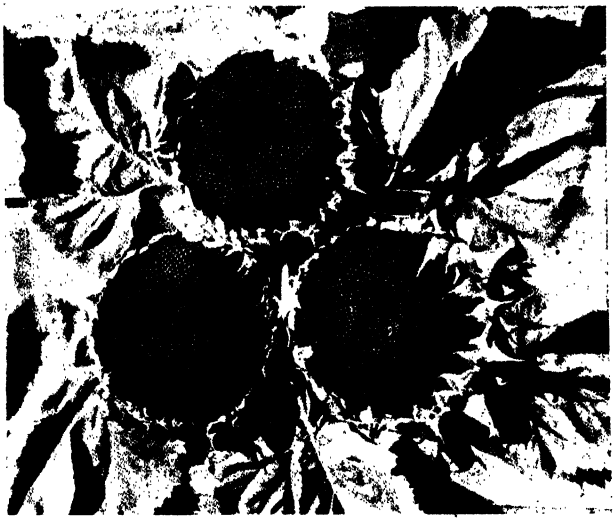
The net result of these increases may not be very severe particularly as, irrespective of devaluation, very few import licences are now being granted for U.S. tractors and equipment, so that farmers are in a position where they must buy either British or European machines even though the United States has until recently been our main supplier of this type of equipment.

However the price differential in favour of British, Australian and European machinery is now likely to be so great, in the majority of cases, that farmers will be glad to take such equipment even though they may not be conversant with the particular make. If the currency had not been depreciated they would still have *had* to buy the *same* equipment because of the chronic "dollar shortage," but there would not have been the same financial inducement as there now undoubtedly will be.

Spare parts for American equipment will also cost more, while even English spare parts may eventually show a slight rise in price. Some fertilisers, sprays and other minor items may also increase in price.

(*Continued on page* 583.)

SUNFLOWERS AS A SEED CROP



World Shortage of Vegetable Oils Makes Sunflowers a Payable Crop

W. M. CURTEIS, B.A., B.Sc.Agr., Special Agronomist.

PRESENT world shortage of vegetable oils has vastly improved the immediate prospect for the sunflower seed industry in this country, creating a market both locally and overseas.

Local oil-crushing firms are interested in the crop as a substitute for olive and peanut oils and last season paid £30-40 per ton for graded seed in Queensland. At these prices sunflowers are a remunerative crop. In addition, the British Ministry of Food has stated that it will purchase any quantity of seed at £25 sterling per ton f.o.b., and will not impose any import restrictions.

Prior to the present vegetable oil shortage, local demand was met by 600 to 800 tons per year which was used by the bird seed trade.

Uses of Sunflower Seed.

Sunflower seed contains from 25 to 35 per cent. of oil. Cold-pressed oil is used as an edible oil in the manufacture of margarine or a salad or cooking oil. The hot-pressed oil is used in the manufacture of soap, lubricants, plasticising materials and paints. It is inferior to linseed oil for the manufacture of paints and varnishes, but can be used as an extender or partial substitute for linseed oil in their manufacture.

Sunflower seed has to be decorticated before the oil is expressed and the oil cake remaining after the oil is obtained is rich in protein and provides a valuable stock feed.

Climate and Soil.

A summer-growing crop, sunflowers require a similar climate to maize, although they are not as susceptible to frost and will grow under drier conditions. For harvesting the seed crop, mechanical equipment is necessary and, therefore, the inland irrigation areas and the north-western wheat areas are the best localities for production.

Although they do best on rich loams, sunflowers adapt themselves to a wide range of soils provided the organic matter is in reasonable supply and there is good drainage and moderate depth.

Fertiliser.

On the Murrumbidgee Irrigation Area superphosphate at the rate of 56 lb. to 1 cwt. per acre gives beneficial results. In the north-west, on the black soils where phosphorus is not a limiting factor for wheat growing, no superphosphate need be applied.

There is evidence that sunflowers may also require a mixed fertiliser containing potash as well as superphosphate. However, no definite recommendations can be made about mixed fertilisers at present.

Soil Preparation and Sowing.

Land should be ploughed as deep as practicable early in the winter months and left in the rough state until late winter or early spring, when it should be cultivated to produce a good, reasonably firm seed-bed. Early ploughing and judicious use of cultivating implements will keep the weeds in check and ensure a good moisture reserve.

Sowings are made in spring, when danger of frosts is over. Whilst October is the best month, sowing may be made as late as early December.

Seed should be sown 12 inches apart and 2 inches deep in rows about 3 feet apart, using a maize planter or a wheat drill with the unnecessary runs blocked. About 5-8 lb. of seed is required to sow 1 acre.

During the early stages of growth weeds should be controlled by inter-row cultivation, but after the plants have made reasonable growth care must be taken not to damage the rapidly spreading roots of the plants.

Varieties.

Sunrise.—In trials conducted by the Department this variety has proved the most satisfactory for header-harvesting because of its dwarf habit, early maturity, even ripening and retention of the seed at maturity.

This dwarf variety, which grows to a height of only 3½ to 4 feet, was introduced from Canada. The heads are smaller in size than in most sunflower varieties, being only from 6 to 8 inches in diameter, and the seeds are small, plump and dark-grey striped in colour. Local tests have shown the oil content of this variety to be at least 30 per cent.

Mennonite.—This is an early, semi-dwarf variety, growing to a height of 5 to 6 feet. It was also introduced from Canada, but owes its origin and its name to the fact that it was grown by Mennonites who came across from the Russian Steppes during the last years of the Czarist regime and settled in Manitoba. It is more a group of types than a uniform variety, and thus there is a lot of variation in maturity, size of the head, height of plant and other characteristics.

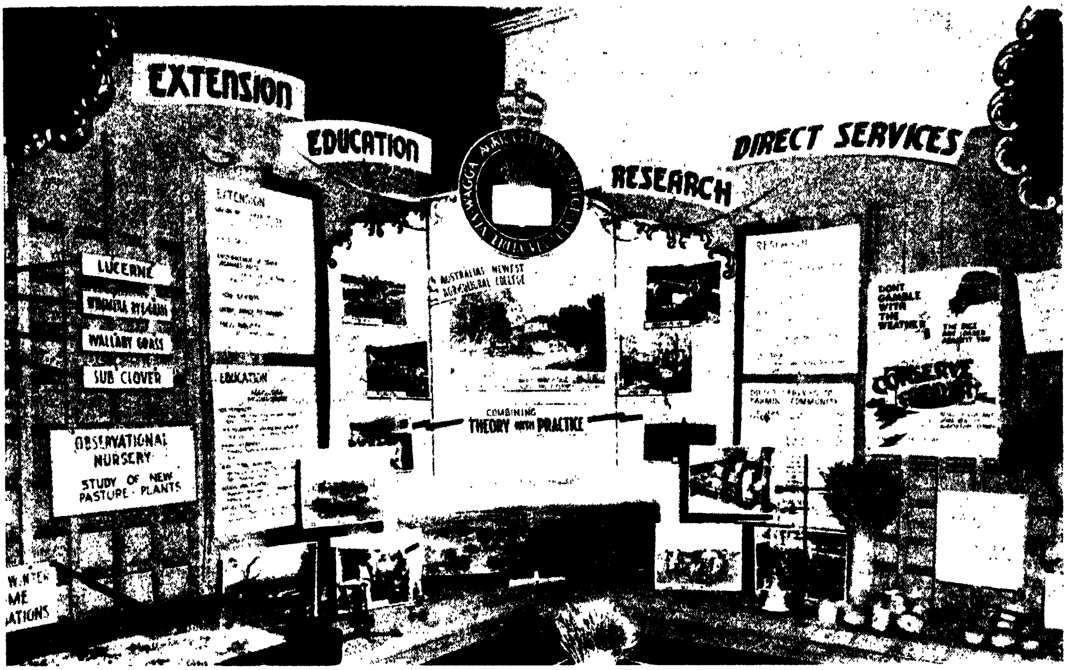
The heads are larger than Sunrise, and their pendulous habit often causes plants to lodge if heavy rains occur during the ripening stage. The seed is medium to large in size, grey striped in colour, with an oil content of 26 to 30 per cent.

This variety is grown to a small extent in Queensland, but is not expected to be popular because of its lack of uniformity.

Advance Hybrid.—This is a hybrid introduction from Canada. Like maize hybrid, Advance hybrid does not breed true, seed having to be obtained each season by crossing two parents, and it is only the first generation seed that is used for sowing. The

(*Continued on page* 604.)

DEPARTMENT'S EXHIBIT AT WAGGA SHOW



A Corner of the Department's Wagga Show Exhibit.

Another View of the Department's Exhibit at Wagga Show.

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1949.

Murwillumbah	November 2, 3
Mullumbimby	November 9, 10
Bangalow	November 16, 17
Nimbin	November 24, 25

1950.

Lithgow (S. J. Williams)	February 3, 4
Paterson (S. M. Reynolds)	February 9, 10, 11
Pambula	February 10, 11
Candelo	February 17, 18
Cobargo	February 22, 23
Newcastle (P. G. Legoe)	February 22, 23, 24, 25
Dorrigo (H. S. Doust)	February 24, 25
Bega (J. Appleby)	March 2, 3, 4
Delegate	March 8, 9
Gundagai (J. C. Sattler)	March 14, 15
Bombala	March 15, 16
Coonabarabran (M. J. Hennessy)	March 16, 17
Cooma	March 21, 22 (or 22, 23)
Dungog (M. Riordan)	March 24, 25
Moruya	March 24, 25
Bulahdelah (C. Wilson)	March 31, April 1
Kempsey (Central North Coast National) (L. H. Riggs)	April 20, 21, 22
Urbenville (S. Stoddart)	April 21, 22
Wagga (G. O. Dewey)	August 22, 23, 24

Approved Vegetable Seed, November, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear the number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

Cauliflower—

Phenomenal Five Months (E.S. 46/2) (99 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1) (95 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—

All Year Round (E.S. 47/10) (88 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9) (90 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (E.S. 47/13) (89 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (H.B. 49/5) (75 per cent.)—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11) (94 per cent.)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Rouge de Marmande (H.R. 49/1) (90 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Red Cloud (H.R. 49/2) (97 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Marglobe (H.R. 49/3) (96 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Break O'Day (H.R. 49/4) (96 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

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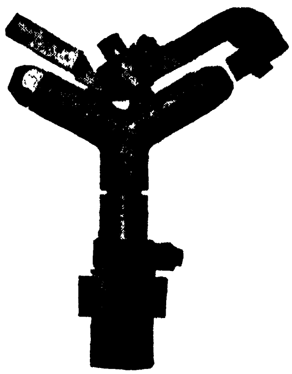

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THE BUSINESS OF FARMING

Notes prepared each month by the Division of Marketing & Agricultural Economics.

CHANGES IN THE UTILISATION OF MILK

PARTLY as a direct result of the war and partly as a result of trends in consumption habits and in population which were further accelerated by the war, the way in which Australia disposes of her milk has undergone considerable changes in the past decade. The main changes are a swing away from butter production towards greater supplies of fresh milk, processed milk and cheese, and a trend towards delivery of whole milk rather than cream to factories.

The Australian Dairy Industry was built mainly on butter. A sparse population meant that the home market absorbed only a small part of production, so that the production of butter for export became increasingly important, especially during the "thirties." In the domestic market, too, butter became increasingly important between the two World Wars, not only as regards total production but also in its importance relative to other uses of whole milk.

As a result of these two influences, rising exports and consumption—almost 80 per cent. of Australia's production of whole milk was going to butter by 1936-37. The situation in the three pre-war years 1936-37 to 1938-39 (average figures) was that the annual production of 1,147.7 million gallons of whole milk was utilised as follows:—

- 78 per cent. for butter.
- 14 per cent. for fresh milk, ice-cream and sweet cream.
- 5 per cent. for cheese.
- 3 per cent. for processed milks.

The position in New South Wales differed slightly; 74 per cent. of the State's whole milk was used for butter and a larger percentage was used for fresh milk, ice-cream and sweet cream.

Since 1939 there has been a steady trend towards less relative dependence on butter. By 1946 the figure stood as low as 63 per cent., and in 1947-48 only 65 per cent. of whole milk went into butter production. During World War II production of whole milk decreased, so that butter took a much smaller share of a smaller production. Australia's production of both whole milk and butter has revived considerably in recent years. However, although Australia produced slightly more whole milk in 1947-48 than in the immediate pre-war years, butter production in that year was still 20 per cent. below the 1936-37 to 1938-39 average.

Utilisation figures reveal that the diversion has mainly been towards fresh milk. In 1947-48 fresh milk, ice-cream and sweet cream absorbed 21 per cent. of whole milk

production, compared with 14 per cent. pre-war. The swing from butter to fresh milk has been even more pronounced in New South Wales, the approximate figures in 1947-48 being:—

Butter, 57 per cent.
Fresh milk, 31 per cent.

New South Wales production of butter has not revived nearly as much as Commonwealth production as a whole, partly because of this more pronounced swing in utilisation, partly because New South Wales production of whole milk is still below the level of the immediate pre-war years.

Cheese also absorbs a greater proportion of Australian whole milk production than in the immediate pre-war years—8 per cent. compared with 5 per cent. However, New South Wales, a minor cheese-producing State, has not experienced this trend in milk utilisation, and still uses only about 2 per cent. of whole milk production for cheese, as in pre-war years.

Another feature in milk utilisation over the past decade has been the increased significance of preserved milk products. In 1947-48 this was an outlet for 6 per cent. of Australia's whole milk, compared with 3 per cent. in the immediate pre-war years. This particular trend in utilisation has been much more pronounced in New South Wales than in the Commonwealth as a whole, although Victoria remains a far more important supplier of these products. Australian production of preserved milk products has increased from 30,000 tons in the immediate pre-war years to 88,000 tons in 1947-48. Production of the most important of these products, condensed milk, has trebled since 1938-39, and that of powdered milk (next in importance) has doubled.

A very important expansion has occurred in another class of preserved milk products which must be distinguished from the full cream condensed and powdered milks because their expansion is not at the expense of butter and cheese. These are condensed and powdered skim milk, butter milk and whey, casein and milk sugar—all produced from the by-products of cheese and butter making. Australian production of the most important of these, skim milk powder, increased from a negligible figure in the immediate pre-war years to 4,064 tons in 1947-48 and 6,629 tons in 1948-49, *i.e.*, nearly one-quarter of our total production of powdered milks. Powdered butter milk and whey are still unimportant, but casein, which has important industrial uses, has risen from pre-war insignificance to a production level of 2,758 tons in 1948-49. Although recent advances in the field of processing milk residues have been considerable, this line is still relatively undeveloped, but it possesses great potentialities.

The final trend to be discussed is one which has considerable effects on all other dairy products and also on the production of pig-meats. This is the 2 per cent. swing towards delivery of whole milk rather than cream to the factories. The trend would be greater if supplies of factory machinery, labour and motor transport were less restricted, and it is also limited by the necessity of twice-a-day delivery of whole milk. (Cream is usually delivered only three or four times a week.)

Causes of the Changes.

A large part of our butter production is an outlet for surplus whole milk. The basic demand which must be satisfied first is local demand for dairy produce, and over 80 per cent. of what is left goes to butter for export. During and since World War II the number of home consumers increased, and population now stands at 10 per cent. above the 1939 figure. As a result the surplus above domestic demand has been considerably reduced. This reduction was even more marked during the war, when whole milk production fell considerably. Since this exportable surplus is butter's "stronghold" in terms of milk utilisation, production of butter has fallen, both in absolute terms and in importance relative to other uses of whole milk.

In the domestic market a change in the same direction has resulted from the high level of war-time and post-war incomes, which has boosted demand for dairy products, especially fresh milk, whilst effective demand for butter has been pegged by rationing. Rationing has resulted in considerable savings of butter for export, *e.g.*, in 1947 it was estimated to have saved 8.5 lb. per head or nearly 30,000 tons, and the ban on the sale of sweet cream saved another

5,000 tons. Annual butter consumption fell from 32.9 lb. per head in the immediate pre-war years to 24.3 lb. per head in 1947.

Connected with this movement has been a rise in the annual consumption per head of other dairy products. Annual cheese consumption has increased over the same period from 4.4 lb. per head to 5.3 lb. per head, that of fresh milk from 23.4 gallons per head to 28.4 gallons. These increases have been partly due to higher incomes and partly due to nutrition propaganda, making consumers more conscious of the dietetic value of milk.

War, with its urgent needs of feeding distant armies, has played a large part in the field of preserved milk. Wartime use encouraged new consumption habits and civilian consumption has risen considerably in the last decade, especially since the end of the war. Consumption per head per annum of full cream powder rose from 2.6 lb. in the immediate pre-war years to 3.0 lb. in 1947, and that of condensed milk from 3.2 lb. to 4.4 lb., whilst exports of preserved milk increased by nearly 400 per cent. during that period.

Processing of milk serves a double purpose. It provides an outlet for surplus whole milk and a means of utilising non-surplus milk residues from butter and cheese-making. Increased urban demand for fresh milk has resulted in a larger surplus, since deliveries of up to 10 per cent. above minimum demand have been necessary to safeguard supply. The surplus has been used for ice cream, sweet cream and other perishables, but an increasing volume of this milk is now being manufactured into full cream powder. To some extent, then, the processing of milk has come into operation as a cushion to seasonal variations in the supply and demand for fresh milk, and has a stabilising effect. The same plant can be used for drying skim milk, butter milk and whey, as for whole milk, and this consideration, together with the advantage that increased delivery of whole milk to factories has provided greater amounts of factory residues and therefore "economies of scale" in treating them, has been partly responsible for increased utilisation of milk residues.

The trend towards delivery of whole milk rather than cream to factories (more advanced in Victoria than in New South Wales), is to some extent a symptom of the reduced relative importance of butter. However, it has been partly caused by the shortage of farm labour and equipment, because the alternative to whole milk delivery is the feeding of skim milk to stock, mainly pigs. Many farmers have preferred to concentrate on one enterprise and accept the premiums paid for non-fat solids by factories utilising milk residues.

Some Effects of the Changes.

The swing from butter to fresh milk has to some extent made the industry less dependent on overseas market influences and more dependent on a more stable local market. Although butter exports have revived from the war-time "low" of 39,700 tons to 81,900 tons in 1947-48 they are still well below pre-war. Moreover, butter exports are dependent to the extent of about 35,000 tons a year on the rationing of home consumption of butter and cream, and to that degree are at a temporary and artificial level.

The trend towards delivery of whole milk at factories and use of factory residues has resulted in many farmers getting a greater return for their milk for less labour, and has contributed to a migration of pigs to grain areas. But a more important effect, from the national point of view, is the opening up of an enormous potential food supply, and the partial elimination of a serious waste of national resources. Whole milk deliveries eliminate one of the main economic difficulties in the utilisation of milk residues, namely the collection of the residues in liquid form. It is a surprising fact that Australia's production of skim milk contains three times as much protein and twelve times as much calcium as there is in our entire meat exports. Yet only 1 per cent. of this valuable food goes to human consumption and every year about 500 million lb. (dry weight) of the "highest quality nutrients known to man" are used for stock or wasted.

In terms of money, this dried skim milk would be worth over £17,000,000 at present prices. Transport and other difficulties would probably preclude the use of at least one-third of this amount, but if New South Wales utilised two-thirds of her production the value of dried skim milk produced in this State would jump from £22,000 to a potential £3,000,000.

Nearly four-fifths of whole milk solids remain in skim milk, including most of the protein and lactose—and it is without a doubt a more economical source of these nutrients than whole milk. It is probable that there will be considerably less scope in the future for raising the income of butter producers by paying them more for their butter. The acute world shortage of fats and oils will not last indefinitely, and better utilisation of milk residues may be an important contribution to the efficiency of the industry and the income of the dairy farmer.

Utilisation in the Future.

Assuming there is no change in consumption standards or whole milk production (except to make an allowance for the cessation of butter rationing) it has been estimated that Australia's population has only to increase by about 2,500,000 (to a figure of 10,350,000) to enable it to use all surplus dairy produce. Commonwealth authorities have predicted that by the end of 1957 Australia's population will be ten million, so that it seems unlikely that there will ever be a return to the situation which applied when butter exports took such a large part of our whole milk production, *i.e.*, when 80 per cent. of whole milk was utilised for butter. Should the above position arise the dairy farmer will be wholly dependent on a relatively stable local market, and utilisation of whole milk would be roughly:—

65 per cent. for butter.

26 per cent. for fresh milk.

4.5 per cent. for processed milks.

4.5 per cent. for cheese.

Whilst the world shortage of fats and oils continues butter exports are unlikely to decline because of marketing difficulties, and butter should at least hold its place in the utilisation table, with unrationed domestic demand as a reserve to be drawn upon when the need arises. However, butter is an expensive fat, and may be threatened in the future, especially in the world market, by margarine, which was improved in palatability and nutritive value during World War II. The possibility of an increase in the proportion of whole milk absorbed by the liquid milk market seems to be largely dependent on future real income levels.

The future for full cream powder is difficult to estimate, as it is not yet a perfect product. In the immediate future greater utilisation of milk residues is limited by a shortage of drying plants, but in the longer run the two vital factors are, firstly, a continuance of the trend towards whole milk deliveries, involving considerable equipment such as milk cans, lorries, etc., and, secondly, consumer education and the development of new uses, to provide a large and stable market. Expansion can only occur over a period of years.

The largest market for skim milk and buttermilk powders may lie in their incorporation in articles of staple diet, such as bakery and smallgoods products. In the United States it is customary to add 6 per cent. of skim milk powder to bread. The C.S.I.R.O. has developed a formula for bread containing 12½ per cent. skim milk powder which yields a palatable loaf of vastly superior nutritive value at an estimated extra cost of one half-penny. Finally, the promotion of the sale of non-fat dry milk solids in retail packages, together with recipes for their use in the home, may provide an important market for the dairy industry in the future.—A. G. LLOYD, Economics Research Officer.

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To preserve the carrying qualities of bananas and minimise the likelihood of the fruit arriving at market in a mixed ripe or boiled condition growers should observe the following points:

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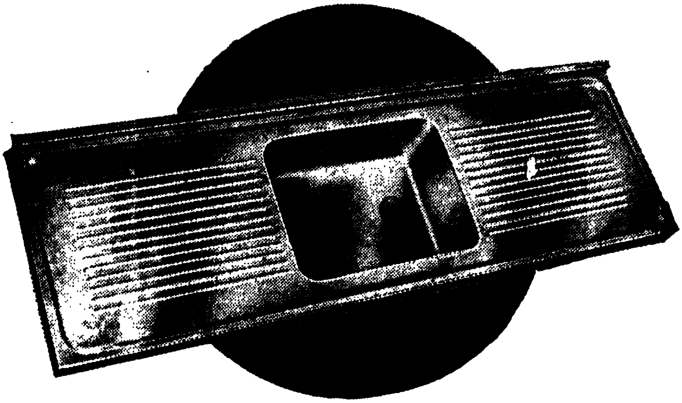
Reduce the time between cutting and the departure of the train or boat to an absolute minimum.

On no account pack any fruit showing the first signs of ripening, with green fruit. All ripening fruit should be rejected.

Protect bananas from the weather during transit from the plantation to the point of loading. —DIVISION OF HORTICULTURE.



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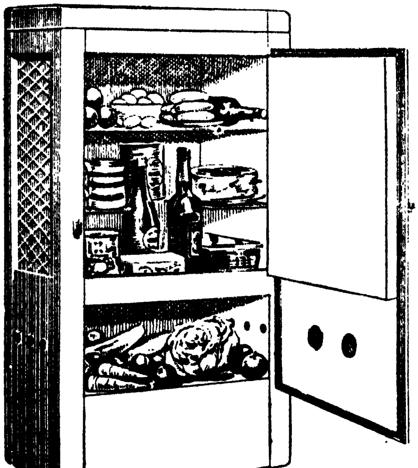

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Comparison of

MANCHESTER OPERATION WITH MULES OPERATION MODIFICATIONS

In Prevention of Flystrike in Sheep

(*Continued from page* 548.)

F. H. W. MORLEY, B.V.Sc., H.D.A., Veterinary Officer.

THE following report of results of experiments conducted under the directions of the Department of Agriculture of New South Wales was prepared by Mr. F. H. W. Morley, B.V.Sc., H.D.A., Veterinary Officer of the Department, and is authorised for publication in the "Agricultural Gazette" of the Department.

THE first portion of this article was published in the October issue of the Gazette. It described the scope of the experiment and gave details of some of the results obtained.

Effect of Treatment on Distribution of Wool-bearing Skin on the Tail.

The distribution of wool-bearing skin over the tail was measured, as described in the previous section. Table 4 presents the results, the figures quoted being the average tail score for the particular group. This figure was obtained by adding the three scores together, so that a perfect tail in this case would be scored as 15.

TABLE 4.—MEAN SCORES FOR DISTRIBUTION OF WOOL-BEARING SKIN ON THE TAIL.

	Treatment.			
	Manchester.	Mules.	Mules Plus Tail.	Control.
Short	14·83	10·23	14·31	10·05
Medium-Long ...	14·92	6·32	13·26	6·44

The results achieved by the Manchester and tail operations are very similar, and show a considerable improvement over untreated sheep. There was no difference between crutch classes in treated sheep—and this would not be expected since all the skin from the dorsum of the tail was removed.

Additional Effects Observed.—One result of the Manchester operation noticed was that the vertical stretching pulled the vulva and surrounding tissues downwards, so that the orifice lay below the level of the pubis. Stretching of the skin over the os coxae caused the bare area to have a rather bulbous appearance.

In addition, this stretching tended to pull the skin around the tail-body junction along the tail, thus causing the stump of the tail to disappear in short-tailed sheep, and on grading for tail length subsequently, the Manchester medium long-tailed sheep were classed about one grade shorter than before treatment.

These results apparently had no adverse effects on the sheep and may be considered as interesting but unimportant details.

Incidence of Flystrike Among Groups.

All strikes were recorded on line diagrams by the workmen dressing the sheep, and these were entered on to experiment cards. Sheep were inspected two or three times per week. Strikes occurring on the same sheep in the same period were only recorded where they appeared independent and not due to deficiencies of the dressing used, or to imperfect dressing of the strike.

Autumn, 1947.—This was not a bad season for flystrike, only about 25 per cent. of strikes occurring in other untreated flocks on the Farm. The incidence of strike was higher (48.5 per cent.) in the experimental controls, probably because of the extra two months' wool growth on the crutch.

TABLE 5.—INCIDENCE OF FLYSTRIKE—AUTUMN, 1947.—Not including strikes noted as resulting from the Manchester Operation. Figures in brackets refer to tail strikes.

Treatment.	Manchester.		Mules.		Mules and Tail.		Total.	Per cent.	Control.			
Tail Length.	Short.	Med.-long.	Short.	Med.-long.	Short.	Med.-long.			Short.	Med.-long.	Total.	Per cent.
Crutch Class A ...	2 (0)	2	...	3 (1)	...	...	7 (1)	4.6	3 (0)	3 (1)	6	24.0
,, ,, B ...	5 (0)	3 (1)	...	4 (3)	...	1 (0)	13 (5)	4.5	17 (2)	5 (0)	22	45.8
,, ,, C ...	1 (0)	...	3 (2)	4 (2)	...	...	8 (4)	5.8	9 (0)	10 (2)	19	79.0
Total	8 (0)	5 (1)	3 (2)	11 (6)	...	1 (0)	28(10)	...	29 (2)	18 (3)	47	...
Percentage ...	8.2	5.2	3.1	11.3	0.0	1.0	...	5.0	60.4	36.7	...	48.5

The position to shearing time in July, 1947, is summarised in Table 5. This does not include those flystrikes occurring in wounds caused by the Manchester operation.

It is obvious that all treatments gave a very substantial degree of control, the outstanding treatment in this case being the Mules and tail operation, in which only one strike occurred in 191 sheep. In view of the excellent results claimed for the Manchester operation elsewhere, the very good result in terms of size of bare area produced (referred to above), the fact that the strikes in this group occurred throughout the season, that unhealed wounds were observed in two cases eight months after treatment, and that in one case of flystrike dressed on 19th May, 1947, it was observed that the strike had extended from an unhealed wound —it seems probable that most of the strikes in the Manchester group occurred in old wounds. In dressing such strikes, it would be unlikely that the old wound would be noticed, and it would therefore not be recorded.

A point of great interest is that in the treated groups the incidence of strike was not significantly different in A, B or C class sheep, although the controls show an extreme difference in this regard.

Spring, 1947.—The spring of 1947 was very wet, and fly-wave conditions persisted until the end of December. Table 6 gives the number of strikes to 31st December.

Again, all treatments gave spectacular control, particularly in the Manchester groups, where only one strike was recorded among 181 sheep. In the Mules and tail operation groups control was also very effective, although there were 3.3 per cent. strikes in the short-tail group. Treatment by Mules

TABLE 6.—INCIDENCE OF FLYSTRIKE—SPRING, 1947. Figures in brackets refer to tail strikes.

Treatment.	Manchester.		Mules.		Mules and Tail.		Total.	Per cent.	Controls.			
Tail Length.	Short.	Med.-long.	Short.	Med.-long.	Short.	Med.-long.			Short.	Med.-long.	Total.	Per cent.
Crutch Class A ...	...	...	...	2 (1)	1 (1)	...	3 (2)	2.0	11 (2)	7 (1)	18 (3)	72.0
,, ,, B ...	...	...	7 (4)	5 (4)	...	1 (0)	13 (8)	4.3	15 (3)	10 (2)	25 (5)	55.5
,, ,, C ...	1 (0)	...	3 (1)	3 (2)	2 (1)	...	9 (4)	6.0	12 (1)	14 (2)	26 (3)	118.3
Total	1 (0)	...	10 (5)	10 (7)	3 (2)	1 (0)	25(14)	...	38 (6)	31 (5)	69(11)	...
Percentage ...	1.1	...	10.5	10.5	3.3	1.1	...	4.4	80.7	68.9	...	75.1

operation alone was not nearly so effective as treatment by the Manchester method or Mules operation with the additional tail operation.

On this occasion there was a small difference between crutch classes in favour of the A class sheep.

In order to estimate the degree of control which might be anticipated in a normal season, when fly activity diminishes rapidly after the middle of November, the incidence of flystrike up to 15th November, and from 16th November to the end of the year are shown in Table 7.

Both Manchester and Mules plus tail treatments gave complete protection for the early period, that is, up to 3½ months after shearing. Protection by the Mules operation alone was good, and three of the four strikes recorded were tail strikes.

TABLE 7.—FLYSTRIKES IN EARLY AND LATE SPRING, 1947.

Period.	Manchester.		Mules.		Mules and Tail.		Total.		Controls.			
	Short.	Med.-long.	Short.	Med.-long.	Short.	Med.-long.	No.	Per cent.	Short.	Med.-long.	No.	Per cent.
To 15th November, 1947 ...	0	0	1	3	0	0	4	0.7	17	18	35	38
16th November, 1947, to 31st December, 1947	1	...	9	7	3	1	21	3.7	21	13	34	37

Protection in the later period was decreased, probably due to the increased length of wool. It seems that in prolonged flywaves, further protective measures such as jetting or crutching may be advisable if the sheep have over 3½ months' wool growth on the crutch area, even if sheep have been treated by Mules operation.

Incidence of Tail Strike.—Examination of Tables 5 and 6 indicates that the majority of strikes in treated groups were tail strikes. In untreated groups nearly all strikes were crutch strikes. From these figures it seems reasonable to assume that all treatments gave adequate protection against crutch strike, and that the superior results of the Manchester and tail treatments were almost wholly due to prevention of tail strike.

Effect of Tail Length.—In both autumn and spring the incidence of flystrike in untreated sheep was higher in the short-tailed groups. This confirms the findings of Gill and Graham (1939) and others. Among treated groups, however, there appeared to be little difference due to tail length. The numbers of strikes are inadequate to test this properly, and the findings of Graham, Johnstone and Riches (1947) have shown conclusively that the medium-long tail reduces incidence of flystrike in sheep treated by Mules operation.

Results from "Edithville," Trangie.

In August, 1947, Mr. Harvey, of "Edithville," Trangie, treated the ewe hoggets by the Mules operation, combined with the tail operation, as demonstrated at Trangie Experiment Farm, similar to that described by Graham and Johnstone (1947). The previous year the hoggets had been treated by the Manchester operation. Results to mid-November when the sheep were crutched were as follows:—

Treatment.	Age.	Number.	No. of Strikes.
Mules and Tail Operation ...	2 year old	430	5
Manchester Operation ...	3 year old	530	4
Untreated	Aged	350	100

Obviously, results from the two treatments are similar, and both are very superior to untreated sheep.

Results from other Modifications of the Mules Operations.

At "Bundemar," Trangie.—3,289 one year old ewes with a very short tail were crutched and treated during the first week in August,

Fig. 6.—Extensive Mules Plus Tail Operation.
[Photo.: R. Meaker.

1947, and up to 20th November, not one treated ewe had been struck on the crutch or tail, although thirty or forty had been struck on the shoulder. This result was obtained during a severe fly wave.

Treatment in this case was extremely radical involving, in addition to the normal Mules operation, removal of all wool-bearing skin from the dorsum of the tail and above the base of the tail, joining the bases of the Mules operation cuts. All wool-bearing skin over this area was carefully removed, leaving only the bare skin of the perineum and under the tail. This extra treatment added considerably to the time required for the operation, about twice as much time being required as for normal Mulesing. However, the treatment was still more than twice as quick as the Manchester operation.

The final result from this treatment was very similar to that of the Manchester operation.

While the results here speak for themselves, the following facts must be considered:—

(1) In our own sheep no strikes were recorded before 20th November in tail-treated groups. In the medium-long tail, tail-treated group, the only strike occurred on 8th December.

(2) The sheep in the Bundemar experiment were unmated. Older sheep treated by a similar radical operation at Bundemar were fly struck to a limited extent, though mainly on the udder during and after lambing.

(3) These sheep apparently required crutching by 20th November, and from the history of the season, it was obviously wise to crutch at this stage. Crutching was still necessary for complete control.

(4) From results obtained at Canonbar (see next section) it seems unlikely that this treatment has much, if anything, to offer over the simpler operation described by Graham and Johnstone (1947).

Comparison of Radical and Less Radical Tail Operations.—

In view of the excellent results at Bundemar it was decided to test the tail operation further, and this was made possible through courtesy of Goldsbrough Mort & Co. Ltd., and the manager of Canonbar Station, Nyngan, Mr. L. Ramage. Here 699 two-tooth ewes were treated on 7th August, 1947, by an operation removing wool from the dorsum of the tail, and joining the Mules operation cuts on either side in the majority of cases. This operation was not quite as severe as that practised at "Bundemar." In

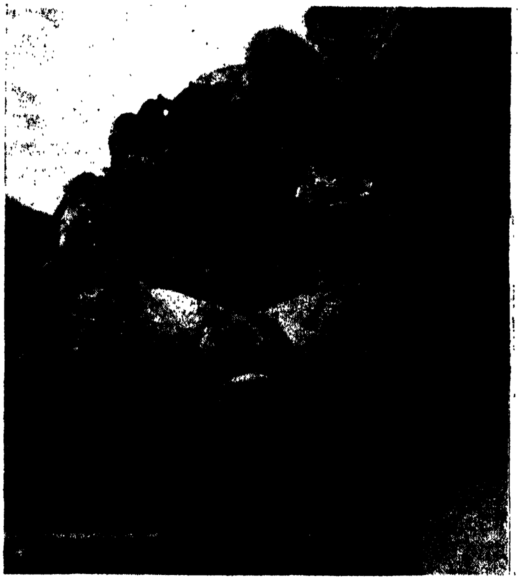

Fig. 7.—Result of Extensive Mules Plus Tail Operation.
[Photo.: R. Meaker.

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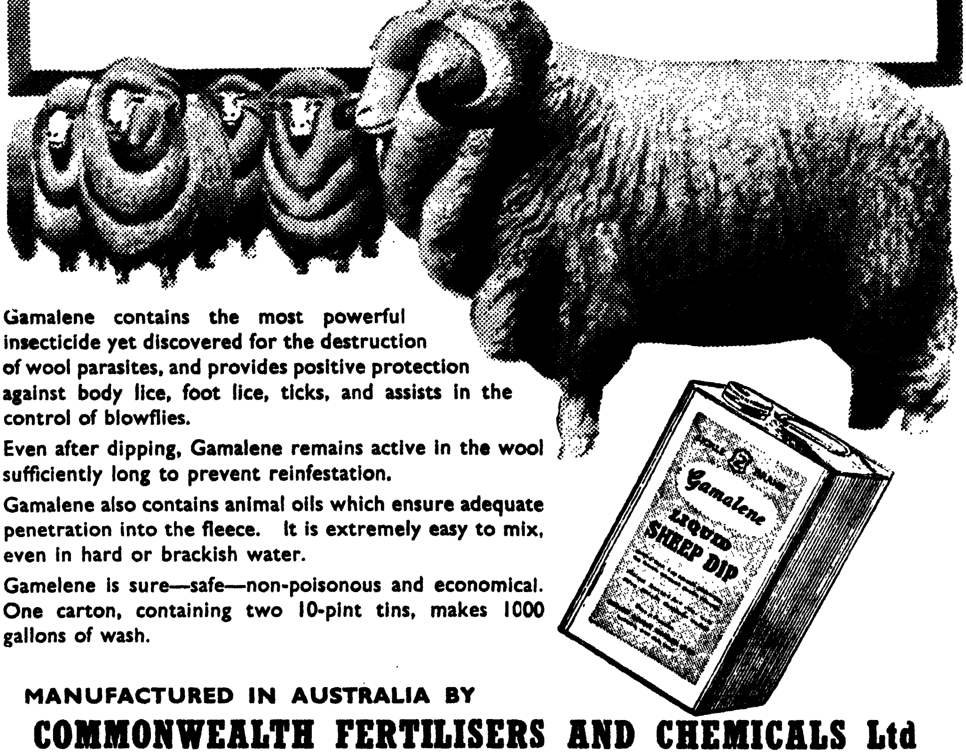

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addition, 719 sheep of similar age were treated with an operation similar to that practised by Graham and Johnstone (1947). These sheep had medium to medium-long tails.

Over the period to 18th November, 1947, 88 strikes (12.6 per cent.) were dressed in the first (radical) group, and 73 strikes (10.2 per cent.) in the second group. Practically all of these strikes appeared to have originated on the udder, and to have extended symmetrically up each side of the breech, and in some cases over the back, without involving the tail. Only two cases of genuine crutch strike were observed, in dry ewes, and these were old strikes which may possibly have originated in the wound. It is of interest that no strikes were dressed before 29th October, 1947. No tail strikes were observed.

Conditions were such over the period that it may be considered one of the worst fly waves known, and the treatment was put through an extremely severe test, especially as floods and extreme shortage of labour made inspection and treatment of these sheep extremely difficult.

From these results it appears that the less radical operation gave protection equal to that given by the more radical operation. As more radical treatment tended to delay healing, it seems generally inadvisable.

At Trangie Experiment Farm.—

A. On the 15th August, 1946, 250 ewe weaners were divided into two equal groups. One group was treated by the modified Mules operation, the other by the tail operation in addition; 93 ewes of similar age were left untreated as controls.

During the healing process six strikes occurred in the wounds of those treated by modified Mules operation only, and one only in those treated by the tail operation in addition. The results are, of course, non-significant. There was no difference in the time required for healing.

During the spring of 1946, drought conditions prevailed and fly activity was at a minimum. Six strikes occurred in the controls, and one in the Mulesed only group in December.

During autumn 1947 conditions moderately favourable to flystrike prevailed, but no strikes were recorded in either treated group, while twenty-two strikes were recorded among the untreated sheep.

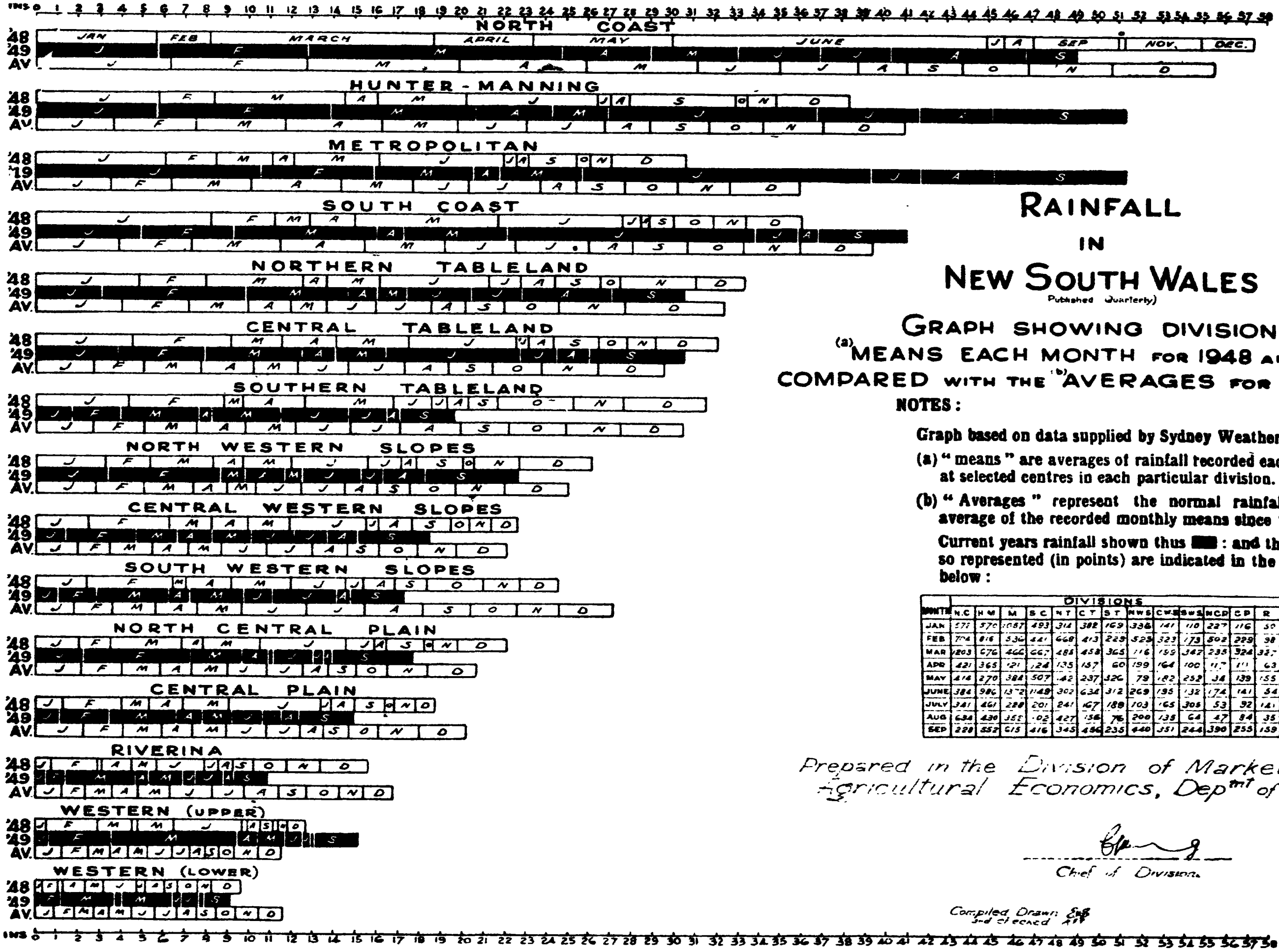
These results indicate that additional tail operation is probably unnecessary in sheep marked to a medium long tail in normal fly seasons. This does not mean that it may not be desirable to use the additional operation, as the increased protection may become important during severe fly waves.

B. A number of sheep were treated with various modifications of the Mules and tail operation. Without going into details of

Fig. 8.—Radical Treatment of the Tail can Produce This Result.
[*Photo.: R. Meaker.*

the results, it may be stated that (*a*) the more radical types of operation took two to three weeks longer to heal; (*b*) cutting a lateral strip of skin from each side of the dorsum of the tail and joining these cuts at the end of the tail produced a satisfactory result, but was difficult to do in many cases; (*c*) it is advisable to remove the wool-bearing skin right to the end of the tail, and to release the wool-free skin from the scar produced by the tailing wound. If wool-bearing skin is left at the end of the tail it may remain anchored there, and cause trouble in the future.

(To be continued.)



RAINFALL
IN
NEW SOUTH WALES

(Published Quarterly)

GRAPH SHOWING DIVISIONAL (a) MEANS EACH MONTH FOR 1948 AND 1949 COMPARED WITH THE (b) AVERAGES FOR PAST YEARS.

NOTES:

Graph based on data supplied by Sydney Weather Bureau.

(a) "means" are averages of rainfall recorded each month at selected centres in each particular division.

(b) "Averages" represent the normal rainfall or an average of the recorded monthly means since 1911.

Current years rainfall shown thus ▬: and the figures so represented (in points) are indicated in the schedule below:

MONTH	DIVISIONS														
	N.C	H M	M	S C	N T	C T	S T	N W S	C W S	S W S	N C P	C P	R	W U	W L
JAN	577	570	1057	493	314	382	169	336	141	110	227	116	50	66	34
FEB	704	816	536	441	668	413	225	525	323	173	502	229	98	295	88
MAR	1203	676	466	667	485	453	365	116	159	347	235	324	327	583	249
APR	421	365	121	124	135	137	60	199	164	100	117	111	63	97	35
MAY	414	270	384	507	142	237	326	79	182	252	34	139	155	130	243
JUNE	384	986	1372	1149	302	634	312	269	195	132	174	141	54	86	36
JULY	341	461	228	201	241	167	188	103	165	305	53	92	141	40	74
AUG	634	430	352	102	427	156	76	200	135	64	47	84	35	11	27
SEP	228	552	515	416	345	456	235	440	351	244	390	255	159	206	121

Prepared in the Division of Marketing and Agricultural Economics, Depmt of Agriculture.

[signature]

Chief of Division.

Compiled Drawn: and checked

STUNTING AND SCALY BUTT OF CITRUS

Associated with Poncirus trifoliata Rootstock

(*Continued from page* 526.)

R. J. BENTON, Principal Fruit Officer (Extension); F. T. BOWMAN, Ph.D., Special Fruit Research Officer; LILIAN FRASER, D.Sc., Plant Pathologist; R. G. KEBBY, Special Fruit Officer.*

THIS article commenced last month. Its purpose is to give an expanded account of the problem of utilisation of trifoliata rotstock and the results to date of investigations which have been carried out.

In October the merits and demerits of the stock were discussed in this issue the authors set out the scope of the investigations undertaken and discuss several aspects of the results.

Scope of Investigations.

Investigations were commenced in 1943, on the main assumption that the stunting and scaly butt problem was probably genetic, *i.e.*, a manifestation of incompatibility between the unreliable varieties and hypothetical "strains" of trifoliata, whereas the reliable varieties were compatible with all "strains" of trifoliata. Strains were assumed to exist purely on the basis of trifoliata being a seedling stock.

An examination was made of variation in the stock mother trees available to nurserymen, and a number of these trees was selected and propagated for rootstock trials. Suckers from notably "compatible" combinations of trifoliata and the scion varieties were also selected and developed as clonal lines by means of cuttings.

A number of propagations of a more exploratory nature was also made. Double working, using an intermediate stempiece of Valencia, with which trifoliata and Washington Navel and other commercial citrus varieties are compatible, was employed in the propagation of young trees as well as for converting mature Valencia trees on trifoliata to Washington Navel. Double working suggested itself in view of the well known use of certain pear varieties as intermediate pieces between the quince stock and those pear varieties with which quince is incompatible. Intermediate stempiece with trifoliata stock has been used in New Zealand[7], where it was stated: "On the basis of tree growth combined with maximum flower formation, Washington Navel on Island Sweet Orange intermediate and trifoliata orange rootstock is the most promising combination."

Trifoliata selections have been worked reciprocally (as the scion) on trifoliata and Rough Lemon seedling stocks. In this series trifoliata was also worked on to Washington Navel intermediate with Rough Lemon stock as a possible means of providing some quick indication of "compatibility" between "strain" of trifoliata and Washington Navel. These scions have, instead, provided evidence of a virus nature of the problem.

The possibility of the bud wood being involved was also entertained in initial experiments, and several propagations were made using bud wood from scaly butted and non-scaly butted sources.

Various propagational experiments started prior to the institution of the Committee were also reviewed within the scope of enquiry, including inarches, young trees of Washington Navel propagated from scaly butt and non-scaly butt sources, and established citrus trees (Thompson Navel) topworked to trifoliata selections, the latter, of course, being a form of reciprocal working using established trees instead of nursery

* The three first-named authors were constituted as a Committee in 1943 to investigate the problem reported herein. Mr. Kebby joined the Committee in 1948 on his appointment to the position of Special Fruit Officer (Citrus) formerly occupied by Mr. Benton.

The authors wish to acknowledge the valuable field assistance of Mr. A. C. Arnott, Fruit Inspector, and Mr. E. C. Levitt, Fruit Officer, as well as officers of Narara Nursery who carried out the propagational work. The keen co-operation of Mr. W. Barrett, of Dooralong, Mr. H. J. Braund, Griffith, and many growers and nurserymen, is also gratefully acknowledged.

trees. This group of propagations has provided the earliest evidence of a virus cause for scaly butt. More extensive propagations are now in progress to investigate more fully the influence of bud wood.

RESULTS OF INVESTIGATIONS.

(A) Variation in the Stock.

Originally trifoliata seed was imported by nurserymen from Japan, but for many years past, about a hundred trees of this species—occurring as hedges, and as isolated trees in the vicinity of Sydney—have been the sole source of seed for local nurserymen. These hedges were grown from the seed imported from Japan at different times. Exhaustive enquiries have failed to disclose whether any of the seedling sources have given superior stocks in the past and, indeed, the exact mother rootstock tree for any particular lot of trifoliata rootstock is uncertain. Fortunately, for investigational purposes, however, the sources are localised and not unduly numerous.

An early approach to the problem of stunting and scaling was an examination of the variation in these seedling trees and their progeny in the nursery. Swingle[17] states: "The trifoliata orange shows surprisingly few variations considering that it has been grown in China for thousands of years and in Japan since at least the eighth century." He then lists the distinct botanical variety *Poncirus trifoliata* var. *monstrosa,* the flying dragon trifoliate orange, and records three

Fig. 5.—Variation in the Growth Habit of Trifoliata, showing Tall-growing Selection (left), and a Selection of Bushy Habit (right).

The plants in each case are clonal and were grown from stem cuttings; aged 2 years.

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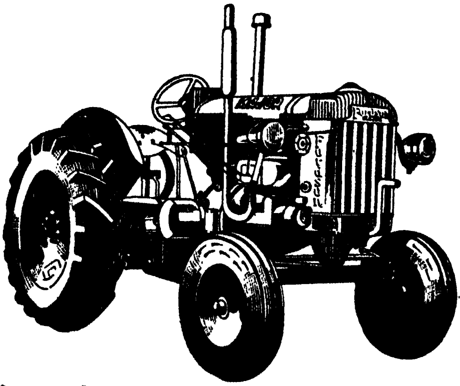

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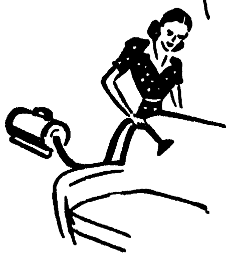

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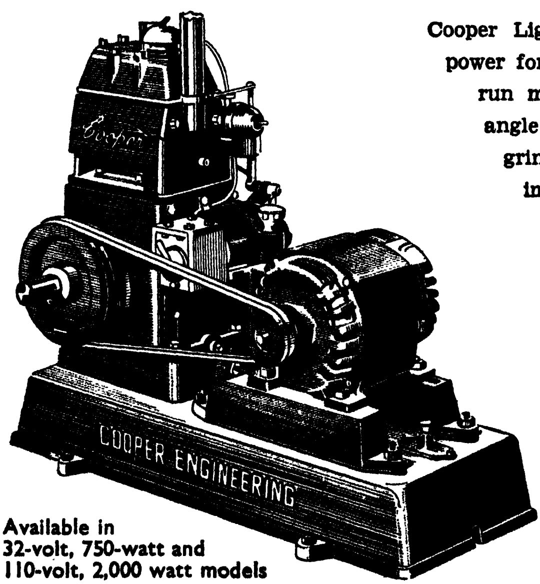

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cultural forms—a small flowered form, a small fruited form and the "sun dust" trifoliate orange. It would appear, however, that these forms are distinct from the common trifoliata used for stock and, in fact, elsewhere Swingle[16] has stated: "The trifoliata orange shows surprisingly little variation. Millions of seedlings are grown every year in the larger citrus nurseries of this country (U.S.A.), but it is rare to see any perceptible variation in the character of the leaves and twigs. The flowers, however, do show variation, often having a partial staminody of the petals (rarely complete) which makes them smaller and less handsome than the normal large flowers. The fruits are usually nearly spherical but rarely are somewhat elongate and papillate, much like a very small lemon." Swingle's illustration[16] shows the large petalled flower like Engler's illustration reproduced in "The Citrus Industry"[17].

No clear cut variation in vegetative characteristics was discernible in repeated examination of the hedge trees and, until a few of these trees with the non-staminoid type of flower were found, it appeared as though the hedge trees showed no variation in flower type. Among young plants raised in the Departmental Nursery, two extremes —tall growing and bush types—with intermediate forms were recognised, and a preponderance of one or the other extreme was discernible in the progeny from certain source trees. Among local propagators the general opinion is that variations in this stock is either non-existent or of a very limited range. Nurserymen who recognise any variation prefer the free-growing taller type for nursery purposes.

Several selections were made among the hedge trees and propagated by budding on to trifoliata or rough lemon stocks.

Suckers from the rootstocks of good rootstock-scion combinations were also selected and propagated by cuttings. The method was as follows:—

Cuttings of trifoliata root fairly readily and the percentage of rooting is increased by treatment with alpha-naphthalene acetic acid, 100 to 150 ppm. Just hardened wood was found to be the most suitable for quick rooting; lengths 4 to 6 inches long were set in sand or sand-soil mixture and maintained at high humidity. Cuttings taken from November to February rooted well in 6 to 8 weeks. Cuttings taken later rooted much more slowly, and fewer roots were produced per cutting, even when maintained at warm temperatures.

Thus as bud clones and rooted clones, individuals have been reproduced in numbers vegetatively, and variation can now be recognised with certainty. Some selections are bushy, others free growing (Fig. 5). Among the clones raised from cuttings, two selections exhibited extreme precocity in blossom

Fig. 6.—Variations in Trifoliata Flowers.
Normal flowers at left; extreme staminoid flowers at right.

formation, these carrying a profuse blossom in the second year whilst other selections produced no blossom. This characteristic appeared again in the third year of growth.

The variant flower forms recorded by Swingle have been observed in hedge trees and the vegetatively propagated selections (Fig. 6). As already indicated, most of the hedge trees bear flowers which exhibit marked petal staminody. In these flowers the individual petal may vary from cases where there is merely a tissue paper like fringe at the distal end of the petal to where

the entire petal is reduced to a curled filament, with or without anther-like developments. With well developed staminody the flowers have a spidery appearance, and in less developed staminody the petals have a membranous, crinkled appearance; both

Fig. 7—Trifoliata Rootstock Worked to Thompson Grapefruit, showing Scaling and Extensive Death of Root System.

are in marked contrast to the bold symmetrical flowers with large and thick petals which are illustrated by Swingle[16] and Hume[15]. In view of these illustrations, as the typical flower of trifoliata, it is perhaps singular that this form is so much in the minority among the hedge trees and selections in New South Wales.

Beyond establishing the existence of variation in what has been recorded as a rather uniform stock, no significance can be attached to the variant forms, until results from trial with them as stocks become available.

(B) Scaly Butt Disease.

(i) DESCRIPTION OF DISEASE SYMPTOMS.

Effect on the Stock.—The first symptom of scaling is the appearance of small, dead areas in the outer bark of the stock below bud union. These are oblong, elongated or scale-like. Subsequently, longitudinal fissures connected by horizontal cracks develop around the margins of the dead areas, separating them from the adjacent bark, and the scales so formed partially lift away from living bark beneath. The first scales may be developed singly or in groups. In very young trees the scales are rather thin (up to 1 mm.), 3 to 8 mm. wide or more and 10 to 25 mm. or more long. Sometimes a small amount of gum is visible beneath them. The process of scale formation goes on intermittently, new scales being cut off beneath the old rather irregularly. As the tree ages the scales become thicker and heavier and of variable shape and size, and adhere rather strongly to the butt.

The rate of progress and severity of scaling shows considerable variability. In the common severe type the first scales are formed at about ground level and the condition spreads almost at once upward to the bud union. In other cases scaling has been observed to start at or near the bud union or in the vicinity of the crown roots, or it may start at one side of the butt and remain restricted for a number of years, only slowly extending up to the bud union or around the whole circumference. In other cases again scaling begins at ground level all around the butt and very slowly progresses up to the bud union.

In severe cases and in older trees scaling extends along the roots for 6 to 12 inches or more. Not infrequently whole roots die out (Fig. 7).

In trees which develop scaling the diameter of the stock is the same as or only slightly greater than that of the scion. Only

in a very few cases does the stock outgrow the scion, whereas in good trees the stock starts to outgrow the scion at the age of 2 to 3 years and in mature trees is several

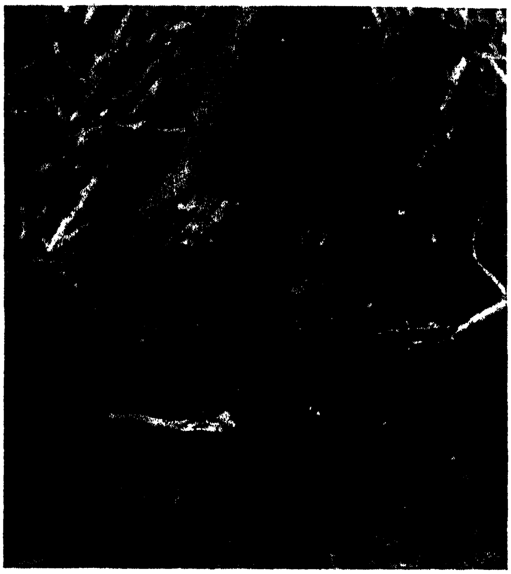

Fig. 8.—Overgrowth of Eureka Lemon on Scaly-butted Trifoliata Rootstock.
Compare with Washington Navel, Fig. 3.

times greater than the scion in diameter, and deeply ribbed (compare Figs. 2 and 3). In the case of lemons on trifoliata stock, the stock may ultimately be of less diameter than the scion.

Effect on the Scion.—Retardation of growth is apparent at the time that scaling is first seen. The degree of stunting varies somewhat. In the most extreme cases the trees do not exceed 4 to 5 feet in height, even when over forty years old, and are rather sparse of foliage. More usually the foliage is reasonably dense but the twig growth very short. Such stunted trees crop well for their size and the fruit is of normal size and of particularly high quality.

Mode of Formation of Scales.—A gum-like substance deposits in a layer of cells in the secondary phloem or deep in the secondary cortex, and tissues external to it die. A cork cambium forms in the layer cells immediately internal to the discoloured cells, and as the result of the activity of this phellogen the bark above it is lifted and cut off as a scale. The process recurs from time to time so that successive scales are formed. The formation of scales means that the functional phloem is periodically reduced to a very small amount of tissue. Occasionally the gum-like deposit occurs in an outer layer of young xylem cells, and this results in the death of all tissues external to it. Whole roots may die out in this manner, or segments of the bark of the butt die and may be partially regenerated from either side. There are as yet no data on the rate of scale formation or its seasonal relationship, if any.

Time of Appearance of Scaling.—In the nursery, trees which will in later life develop scaly butt show no symptoms which have so far been detected. Field observations of a large number of plantings indicate that scaling symptoms show up between the fourth and eighth year from budding. If a tree reaches the age of eight years without showing scaling there appears to be no danger that it will subsequently develop the disease.

Effect with Different Scion Varieties.—The incidence of stunting varies with the different varieties of citrus. With the Washington Navel orange, which has been the chief

Fig. 9.—Self-rooted Eureka Lemon.
Dead trifoliata stock shown at (*a*); lemon root at (*b*).

variety studied, it varies from 0 to almost 100 per cent. of trees in any one block. Whole plantings are known where every tree

is satisfactory; others where almost every tree is excessively stunted; others again where there is a mixture of satisfactory, of partially stunted and of excessively stunted trees. The Thompson Navel orange behaves in a similar manner.

Late Valencia, St. Michael and Australian Navel oranges have been generally satisfactory on trifoliata stock. Scaly butt has been absent or so rare as to be of negligible importance. The reaction of Jaffa, Joppa, Siletta and Mediterranean Sweet is not known.

Two blocks of Valencia oranges, however, are known where the percentage of scaly butt is unduly high. One of these, with 10 per cent. affected trees, was propagated by the grower, using buds from a number of parent trees of good type on rough lemon stock in his own orchard. In the second block the number of affected trees approached 50 per cent. These buds had been obtained from a few trees of good type on rough lemon stocks at Gosford.

Emperor, Ellendale and Unshiu (Satsuma) mandarins on trifoliata stock are also satisfactory. Scaly butt is absent or rare. Clementine and Thorny mandarins are unsatisfactory, developing a high percentage of scaly butt. Dancy and Beauty of Glen Retreat mandarins have not been tried on this stock in New South Wales and their reaction is not known.

Only a few blocks of Eureka lemon on trifoliata stock are known in New South Wales and these are uniformly unsatisfactory. The trees may reach a height of 6 to 8 feet but often die out. Scaly butt develops on 100 per cent. of the trees at an early age, the stock is usually overgrown by the scion (Fig. 8) which may form its own independent root system and grow vigorously. The trifoliata root often dies (Fig. 9). The very few trees of Lisbon lemon known on this stock in New South Wales are all affected with scaly butt.

Thompson grapefruit on trifoliata stock behaves in a similar manner to Washington Navel orange. Wheeny grapefruit has not been used extensively on this stock, but the percentage of scaly butt appears to be fairly low. The relationship of Marsh grapefruit to trifoliata stock is somewhat more complex than that of the Valencia or Washington Navel orange. Very considerable variation in size of tree occurs. In any block one commonly finds trees of good size and very dwarfed trees, and one or two classes of intermediate growth. Blocks under observation are for the most part young (ten years old or younger) and scaling is not evident whereas in Washington Navel and Valencia, scaling is usually apparent at four to five years.

(To be continued.)

"Bridestowe Petunia's" Fine Record.

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"Bridestowe Petunia" established these figures under the rules of Division I (Official Section) of the Herd Production Improvement Scheme administered by the Department of Agriculture.

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"This cow is the forty-third Jersey in New South Wales to produce over 1,000 lb. of butter during a period of twelve months," said Mr. Graham, "and this is the fifty-fourth occasion on which a New South Wales Jersey has produced over 1,000 lb. of butter in 365 days, several animals having performed the feat more than once."

("Bridestowe Petunia" was sired by "Headlands Sybil's Sultan" (17573) by "Mittabah Bowlina's Sultan" (8596) ex "Woodside Park Rochette's Sybil" (51305): her dam was "Bridestowe Emblem" (65609) by "Wisteria Oliver" (7424) ex "Kameruka Fairy Dance" (48905).)

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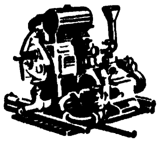

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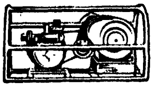

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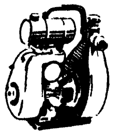

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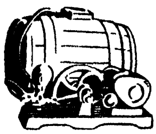

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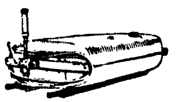

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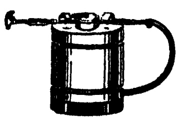

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Agricultural Bureau Organiser Appointed.

HON. E. H. Graham, M.L.A., Minister for Agriculture, has announced that Mr. James Slater, H.D.D., former Dairy Officer at Tamworth, has been appointed Organiser of the Agricultural Bureau of New South Wales.

Mr. Graham stated that Mr. Slater farmed with his father on the North Coast until 1929 when he entered the service of Norco Co-operative Society at Kyogle. Eight years later, with experience in every aspect of butter-making, he won the Norco Bursary to Hawkesbury College and gained his H.D.D.

"Returning to Norco from Hawkesbury, Mr. Slater worked at Kyogle and Nimbin butter factories, and in 1940 was appointed first cheese-maker at Dunoon Cheese Factory," said Mr. Graham. "He enlisted in the A.I.F. in 1942, served in Australia and New Guinea with the 2/33 Infantry Battalion.

"Entering my Department in 1946," Mr. Graham went on to say, "Mr. Slater was appointed Assistant Dairy Instructor, Tamworth, where his organising capacity stimulated and maintained enthusiasm in such rural groups as herd recording units, and a citizens' welfare league for recreational activities. Transferred to the Department's Division of Information and Extension Services for a short period in December, 1948, Mr. Slater gained valuable knowledge of Extension Service.

"Because of his qualifications and experience," Mr. Graham concluded. "I have the utmost confidence in the work he will perform as Organiser of the Agricultural Bureau within the Division of Information and Extension Services of my Department."

Export Quota for Grain Sorghum.

AN export quota of 50 per cent. of the total grain sorghum production from the 1949-50 season has been granted by the Commonwealth Government.

This announcement will be welcomed by grain sorghum growers, particularly in the Inverell district and in the north-western portion of the State where the growing of this crop has become an established practice.

Previously, the area sown to grain sorghum had been limited mainly by doubts regarding a satisfactory market.

Hon. W. F. Sheahan, M.L.A., when Acting-Minister for Agriculture, commenting on this decision, said it was desirable to retain an adequate supply of grain sorghum in Australia owing to the increasing popularity of this grain as a stock food. There was also the need for the demand to be met consistently and so sustain and build up the market for grain sorghum. Local demand was influenced mainly by the availability of wheat and oats and, naturally, the forthcoming harvest of these grains would regulate, to some extent, the quantity of grain sorghum available for export.

"Grain sorghum is one of the most economic crops to grow from the point of view of seed costs and harvesting. It responds well to good soil preparation. No doubt, growers in the better rainfall areas of the State will take advantage of this timely announcement," said Mr. Sheahan.

Devaluation and the Farmer—*continued from page 562.*

The Position in Brief.

The position can therefore be summed up in the following terms:—

(i) Wheat and wool producers can expect appreciable increases in their incomes which should more than offset any increase in their costs.

(ii) Other producers cannot expect any appreciable increase in incomes immediately but their costs will rise.

(iii) The rise in costs will however be slight except where very extensive use is made of machinery, particularly American machinery.

(iv) Export prices for dairy products and eggs and some other goods may rise slightly at a later date as a delayed result of devaluation.

(v) Producers will be forced both by price levels and import restrictions to purchase mainly Australian, British and European tractors, cars, and other machinery, in place of the American product to which the majority have become accustomed. This does not, of course, apply to most tractor-drawn implements, the Australian market for which has for some time been supplied almost exclusively by Australian manufacturers.

FRUITGROWING

ORCHARD FURROW IRRIGATION

Problems of Faulty Irrigation Designs

A. H. SKEPPER, H.D.A., Fruit Officer, and J. R. DAVISON, Fruit Inspector.

IN the early days of irrigation settlement Australia was dependent largely on overseas countries for knowledge and experience of irrigation practices. Naturally, this knowledge of water usage related to soil characteristics different to those obtaining in this country. It is not surprising, therefore, that many initial mistakes in layout, method and amount of water applied, were made in districts or areas resumed for irrigation settlement—particularly as far as horticulture was concerned.

With annual and other short-term crops these errors can usually be rectified without much trouble. However, with long-term crops such as fruit trees the story is somewhat different, and throughout the life of the planting many such errors can never be entirely adjusted. Even when an individual block of trees is pulled out and the land prepared for replanting it is often difficult to change the irrigation design, as the surrounding blocks may impose limitations.

Faulty Design.

Problems due to faulty design generally come under three headings: (1) slope; (2) length of row; and (3) soil type. When considering the planting design, all three of these should be considered in relation to one another, as each has an important bearing on the other.

A fourth and important factor in efficient irrigation is an adequate water supply. On irrigation areas where plenty of water is available, deficiencies in supply are due to inadequate irrigation structures. When the trouble is on the farm itself the trouble can usually be rectified whether the land be planted or not. Adequate ditches or pipelines maintained in good condition, free from obstructions, and with outlets which will permit the use of good flows, with control of the flow, are necessary.

Problems associated with slope fall into two groups, (a) steep grades, and (b) slack grades. Aspects of these problems are discussed hereunder.

"V" Furrows.

When the slope is too steep, water will tend to run too fast in the furrows. The result is that only a small proportion of the area desired to be covered is wetted, as under the required head of water the actual stream is confined to a small area in the bottom of the "V." If sufficient head is used to fill the furrow, scouring becomes a certainty, and with particular severity at the intake end of the furrow. In addition, there are sure to be excessive losses of water and flooding of the bottom lands. Under such conditions it is common to find well-grown trees near the headland over which water flows for the longest time, and near the bottom of the furrow-run where water will accumulate—with stunted trees in between.

Continued scouring of furrows will gradually build up the bottom lands, but only at the cost of eroding the top of the slope and with resultant loss of fertility there. Some cases have even been seen where, in a long run on a steep slope, the headland is a foot lower, and the bottom land a foot higher than they were when irrigation had commenced about twenty years previously.

The only permanent way of controlling this situation is to change the planting design. However, if this is impossible, there are several practices which will help to give better irrigation.

The first step is to do all possible to improve penetration rate of the soil.

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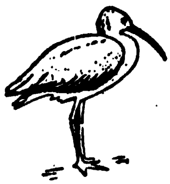

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Neutralising Value 78

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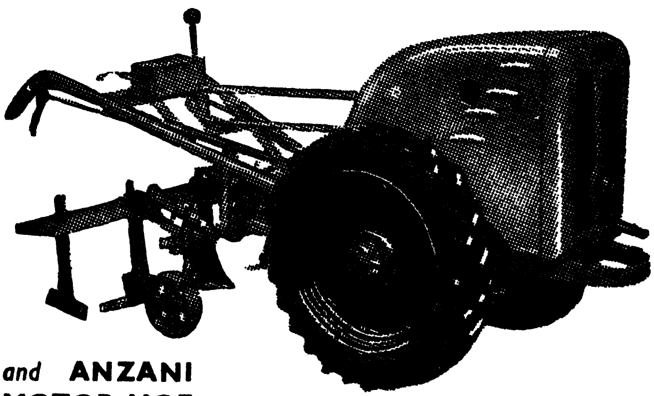

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Black Spot. Use Neptune Lime Sulphur combined with Neptune Arsenate of Lead and Neptune Lime Casein Spreader as a cover spray. Do not combine with oil.
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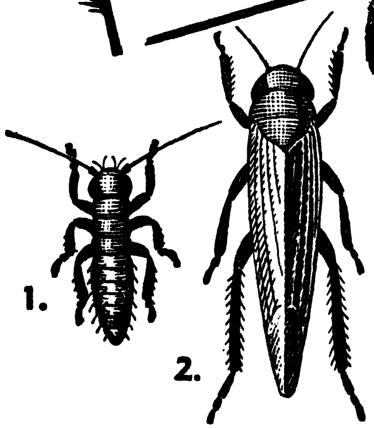

1. 2.

3.

APPLE LEAF-HOPPER
(Canary Fly, Jassid)
1. First stage of nymph, greatly enlarged. 2. Winged adult, greatly enlarged. 3. Apple leaves infected with leaf-hoppers, actual size.

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Avoid excessive cultivation and follow a practice of reasonably "dirty" culture.

The presence of weeds and trash tends to permit a more rapid penetration of water, and at the same time impede the flow—thus ground as possible, instead of narrow "V" furrows, will often overcome the problem if soil structural conditions are reasonable, and the slope not extreme. Also, broad-base furrows tend to erode less than narrow "V" furrows.

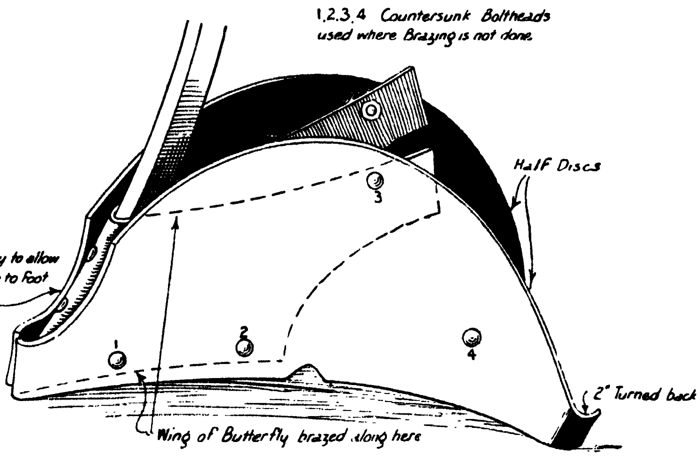

Fig. 1.—Elevation of Broad-based Furrower.

Made from plough disc cut in halves.

Two of these are mounted on a cultivator frame.

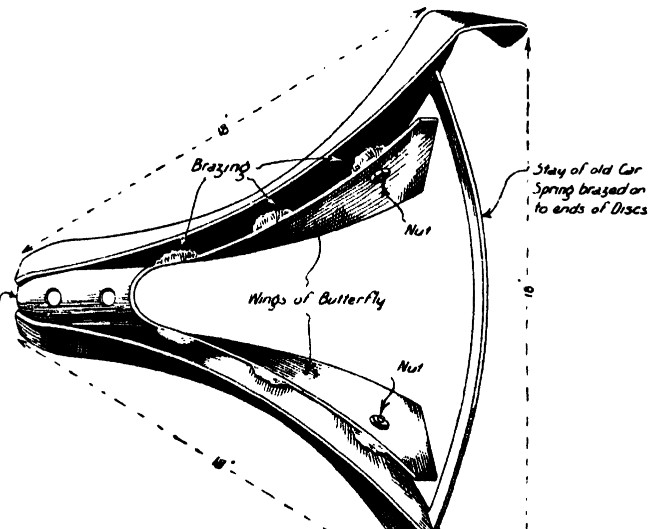

Fig. 2.—Groun Plan of [Broad-based Furrower.

Showing method of brazing or bolting disc and position of stay.

raising the depth of water in the furrow and bringing about a condition approaching that of a flatter grade.

The use of broad-base furrows, or where possible the use of border-check flooding so as to wet as much of the surface of the

Remember, though, that under some conditions of slope and soil-type, the water, instead of spreading over the base of the broad furrow or check-bay, will tend to concentrate in a narrow stream and so defeat the objective of this system. Under these

circumstances, the use of a large number of "V" furrows placed close together is preferable.

The practice of furrowing out in both directions, thus providing cross-furrows to allow lateral flow of water into the tree line, is a useful method of increasing the wetted area and providing more efficient irrigation.

The system known as sod-culture can be used to advantage in some circumstances when the slope is excessive, provided there is no appreciable cross-slope. This consists of sowing down a permanent cover crop such as white clover, and using the border-check flood system of irrigation. Care must be exercised in the first instance to see that the land is well graded.

The cover crop provides protection against soil erosion, and at the same time aids in the penetration of water. Better penetration is achieved as the result of the better soil structure built up by lack of cultivation and by the effect of plant roots on the soil. Frequently mowed, the cover crop does not over-impede the flow of water, and surface drainage is not greatly interfered with; it will also guard against excessive competition with the tree when evaporation rates are high in midsummer.

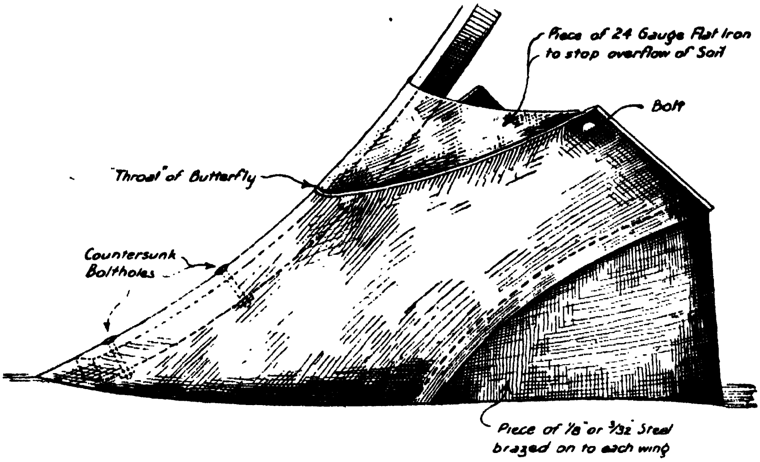

Fig. 3.—Elevation of Another Broad-based Furrower.

Made by welding extensions on to ordinary "V"-type butterfly.

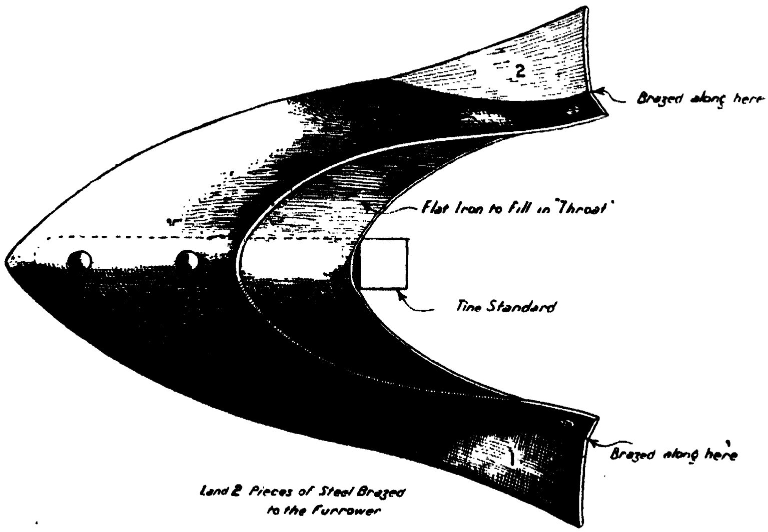

Fig. 4.—Ground Plan of Furrower Shown Above.

As many of these as required are mounted on cultivator frame.

Useful where soil surface is not well tilled, and in stiffer soils.

Sod-culture can be dangerous under some conditions of slope and soil type, such as where the soils are sandy and very permeable—therefore due consideration must be given to all factors before adopting this system.

Sod on slopes of very permeable soil type fares best under spray irrigation or where stand-pipes from underground low-pressure mains can be used to water short runs.

Under ordinary furrow irrigation the use of this system is limited to soils which, though permeable, are not excessively so. Soils which are wetted 25 inches to 30 inches in thirty minutes will obviously readily overwater if the use of sod impedes the flow to even half as long again as is desirable.

Slope Too Flat.

This condition usually results in overwatering of the top end of the row owing to the excessive time taken to get water to the far end. Flat grades are more dangerous on light, permeable soils and the effect is aggravated where the rows are long.

Generally little can be done to correct the slope by grading, but much can be done by correct management to improve watering efficiency.

If the rows are too long, the effective length of run can be shortened by various means, such as:

- A permanent ditch midway.
- A temporary ditch or large king-furrow which can be cultivated out and repaired at will.
- A pipeline with stand-pipes or "risers."
- Taking the flow of water down one furrow to a large king-furrow drawn across the direction of flow halfway down the run, where it is diverted into the full number. When the bottom half is completed, the top half can be watered. This will effectively cut down the length of time of irrigation and even-off the intake in the bottom and top halves of the area watered.

Cultivation practices must be such as to provide good clean furrows. This does not mean that cultivation must be frequent and weeds not allowed to grow, but it does mean that furrows should be kept clean. For this purpose the use of special furrow-cleaning shovels might be considered (see diagram). It is largely a waste of effort, and detrimental to the soil, to cultivate all the land merely to control weeds within the furrow.

Large flows of water in each furrow are necessary to get the water to the far end of the furrow within a reasonable length of time. This means that supply ditches must be of good capacity and kept free of weeds and other obstructions so that the necessary flows can be obtained.

Variable Slopes.

Occasionally there are blocks of trees planted to an incorrect slope which may be improved by making use of the cross slope. With deciduous trees it is sometimes possible to water on the diagonal with advantage, and with both citrus and deciduous trees, watering at right angles to the layout sometimes gives better results.

The problem of incorrect slope, difficult as it may be when the slope is uniform, becomes even worse when there are marked changes in grade along the row.

In this case each section requires different management. If circumstances permit, dividing the block into two sections and watering each separately is usually the best method of obtaining uniform and satisfactory watering.

Where the slope is flat at the top end of the row and steep at the lower end, the result is either overwatering at the top end, insufficient water at the lower end, or both. The position may be alleviated somewhat by permitting extra weed growth in the area of steep slope, but with many cultivation implements this is not always possible. In this case, in some localities it is possible to apply soil dressings of such material as rice hulls or other trash to improve penetration on the steep sections.

Irrigation may be adjusted by using large flows in only half of the furrows over the flat section, and by splitting the water up between all the furrows, with a consequent reduction in flow in each, on the steep section. An additional aid to better watering on the steep sections is the use of cross furrows to carry water into the tree line—thus reducing the dry "bone" to a minimum.

Where steep slopes occur at the top end, with flatter grades occurring at the lower end, the principle of management is much

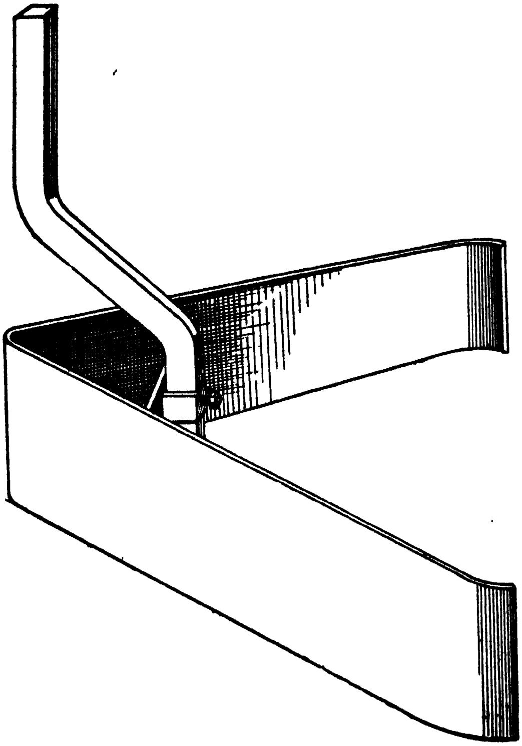

Fig. 5.—Broad-based Furrower.

Using both the furrower shown in Fig. 1 and this one, a good surface mulch of free-running soil is necessary, as both tend to collect weeds.

[*After C. J. Horth.*

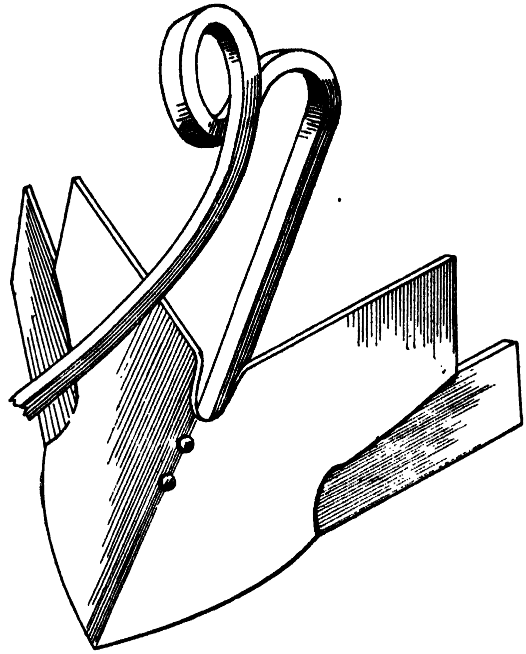

Fig. 7.—Weed Cutter for Broad-based Furrows.

Extensions of wings brazed or welded to "V"-type butterflies.

Efficiency of this cutter is affected by the angle of the blade to the ground.

[*After Taylor.*

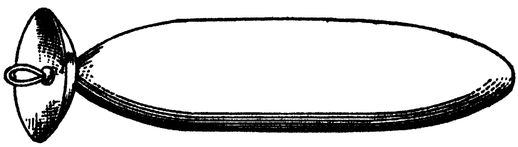

Fig. 6.—Concrete "Torpedo" Type of Broad, Round-based Furrower.

The disc is from an offset disc gang. The cut is assured by making the diameter of the concrete "torpedo" about 1½ inches less than that of the disc. This "torpedo" can also be used to clean out furrows where the weeds are not too long or mature. Suitable for fairly permeable to permeable soils on flat grades, as the heavy torpedo compacts and smoothes the furrow. The back is streamlined to facilitate manoeuvrability.

[*This furrower was developed by Mr. L. A. Wincey, of Hanwood.*

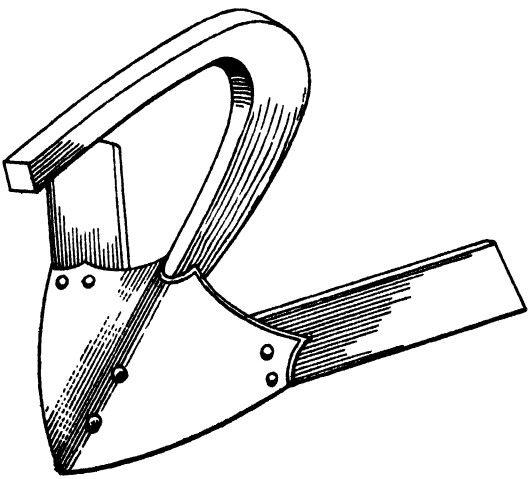

Fig. 8.—For Cleaning Weeds from "V" Furrows.

Note that butterfly wings are cutaway.

[*After Taylor.*

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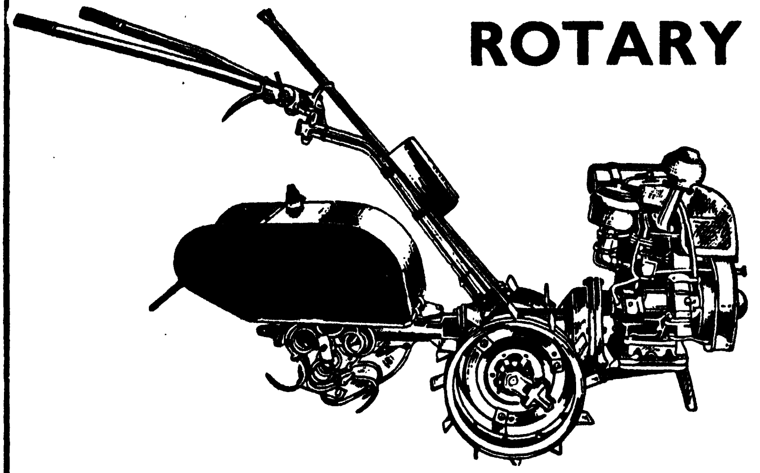

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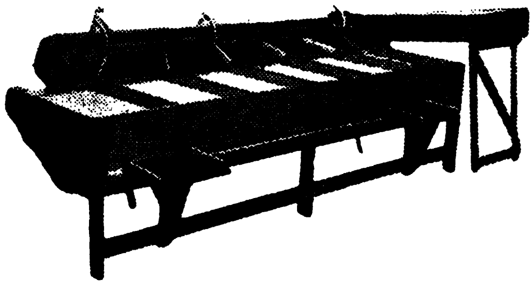

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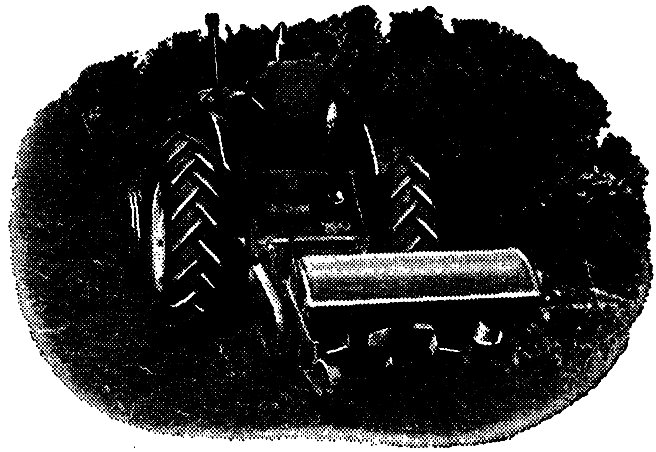

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the same as with the reverse situation, except that it is usually somewhat easier to control the extent of penetration of water.

Where the irregularities of slope are of a nature which will permit correction by grading, then grading must be the final answer to the problem.

While excessive grading damages the land and should be avoided, it is a lesser evil than inefficient irrigation.

When planting new areas or replanting old land, a planting design which will give uniform slope without excessive grading should be employed.

Contour planting will achieve the desired result in many difficult situations.

Problems Associated with Length of Run.

Long irrigation runs, particularly when associated with the more permeable soils and flatter grades, make uniform watering more difficult to achieve. The top ends of the rows tend to get more water than lower down.

Theoretically all that is needed to overcome the difficulty of too long a run is the use of larger flows of water.

There are, however, practical limitations to the flow of water that can be used in a furrow. Also, when irrigating through a cover crop there is a limit to the speed in which water can be pushed to the end of a long row, and overwatering of the top end occurs before the water reaches the lower end.

When a dense cover crop has been turned in it becomes almost impossible to construct decent furrows free from obstructions—and again difficulty will be encountered in avoiding overwatering portion of the block.

When the length of run can be shortened by installing another supply ditch or pipeline, then a permanent cure for the difficulty is possible without having to wait for the trees to be removed in order to re-design the area.

In many cases the use of a temporary ditch across the centre of the block so as to provide water for the lower end is a useful method where difficulty is only experienced at certain times of the year in the watering of the long run.

For example, such a ditch could be made by putting up a couple of crowder banks in the autumn, to provide for the early spring waterings when cover crops give trouble.

Later in the summer, when good clean furrows can be made, the temporary ditch may be dispensed with and the entire block watered from the main ditch.

The spring cultivation programme can either add to, or lessen the difficulty imposed by long runs.

For the first spring watering, if given before the cover-crop is turned in, the disc plough is very useful for making clean good-sized furrows through the crop.

When discing in the cover crop do not plough deeply, but cultivate as shallow as possible—just deep enough to chop down the crop. It will then be relatively easy for a disc implement to open up good clean furrows. While shallow cultivation may not permit much better furrowing-out when shovel-type furrow-openers are used, the fact that the land is more or less compact and not a loose, open mass will permit better control of irrigation water and assist in avoiding over-watering.

Soil Types and their Problems.

Owing to the wide variations in permeability and capacity, each soil type requires a different irrigation management.

Where soil is more or less uniform over an area it is relatively easy to plan an irrigation design that will suit that particular soil.

Where, however, soil types vary considerably it is not desirable to have two widely differing types occurring in the same irrigation run.

It becomes particularly dangerous when the set-up is such that the irrigator has to water through a light permeable soil to a heavier soil at the lower end. For example, the light soil may only require water in the furrows for twenty to thirty minutes to give adequate penetration, whereas the heavier soil may not absorb sufficient water in under two or three hours. To keep the water for

this length of time on the heavier soils would mean that the area of lighter soil would be grossly overwatered.

To reduce this overwatering to a minimum, everything possible should be done to improve the penetration rate of heavier soil. The object should be to take the water over the lighter top end of the run as quickly as possible, and to allow the heavy soil longer to penetrate.

This can be achieved by following the same practice as described earlier for too-long runs on slack grades. Because the penetration rate decreases as the speed of flow over the ground increases, taking the flow of water through fewer furrows up to the beginning of the heavier soil-type, where the flow is spread into the full complement of furrows, will help to even up the overall penetration.

The furrows in the lighter soil, which are idle until the heavy end is watered, can then be used to wet the rest of the upper end, and so complete the irrigation of the whole area.

All this may mean added work with furrowing implements and shovel, but it is surely worth while when the health and longevity of the planting as a unit is considered.

Heavy soils occurring at the top of the slope, and lighter soils at the lower end, are not nearly so difficult to manage. With care in cultivating and irrigating, overwatering the lower end of the run can be avoided.

Many of these problems are inherent with the topography of the farm. Many can be traced to faulty design which resulted from the early lack of appreciation of the limitations set by the soil type and slope factors, and by changes in soil structure due to years of irrigation.

Those factors were not known in the early days of settlement, but they are known now. When they are given the consideration they deserve and, in fact, demand, then the paramount importance of correct layout for individual units will be given its due recognition.

Irrigation Equipment.

Much can be done towards good irrigation control, even under difficult conditions, when suitable implements are available for good preparation of land for watering.

One of the most important needs is a suitable implement for furrowing-out. While certain types of furrowing-out shovels are available from implement manufacturers, many of these do not prove satisfactory in all circumstances.

Much has been done to adapt standard shovels for special requirements and some examples of these are illustrated in this article.

Symmetrical Pears Needed for New Peeling-Coring Machinery.

THE latest type of peeling and coring machinery now in use at a Leeton cannery has created a problem for canneries, fruitgrowers and research officers of the Department alike.

The Williams pears being grown on the Murrumbidgee Irrigation Area are rather rough and irregular in shape. While this did not matter much when pear skins were removed in lye solution, the new machines need a smoother and more symmetrical fruit—otherwise loss of fruit flesh in removing skin and core is too great.

In an effort to produce pears of a shape to suit these machines, the Department's Division of Horticulture has begun investigations at Yanco Experiment Farm.

New South Wales Cornsack Allocation.

"SIXTY thousand bales of cornsacks have been allocated to New South Wales for the coming wheat harvest." The Minister for Agriculture, Hon. E. H. Graham, M.L.A., recently said this in the Legislative Assembly, stating that he had recently received this advice from the Minister for Commerce and Agriculture.

"The State Wheat Committee considers the allocation satisfactory and is giving particular attention to the distribution of the sacks," continued the Minister.

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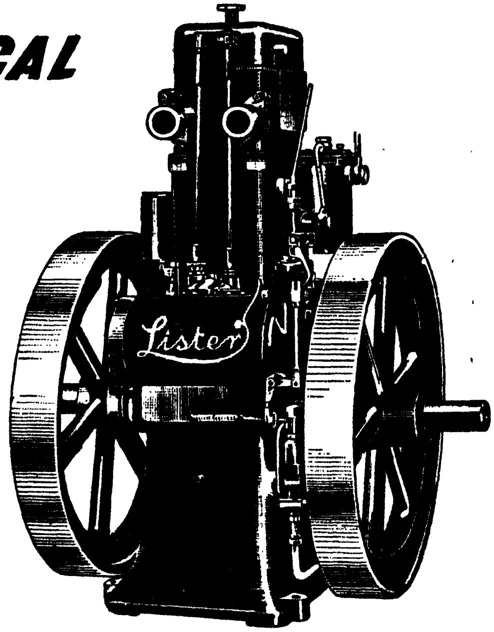

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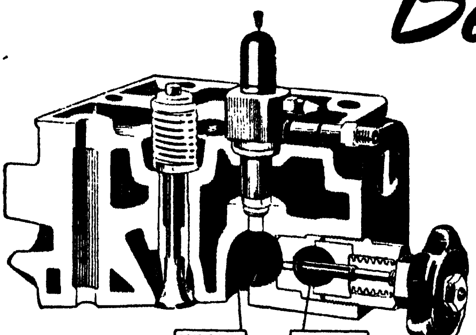

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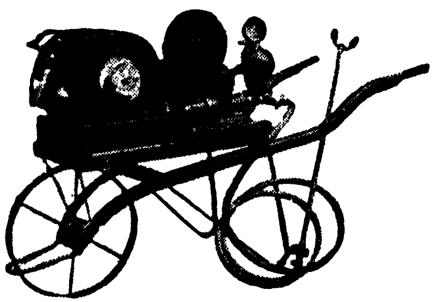

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INSECT PESTS.

Notes contributed by the Entomological branch.

CARPET BEETLES AND CLOTHES MOTHS

AT the approach of warmer weather, the adults of clothes moths and carpet beetles will begin to make their appearance in numbers, from hiding places where their larvae have been developing during the cooler months.

Carpet Beetles

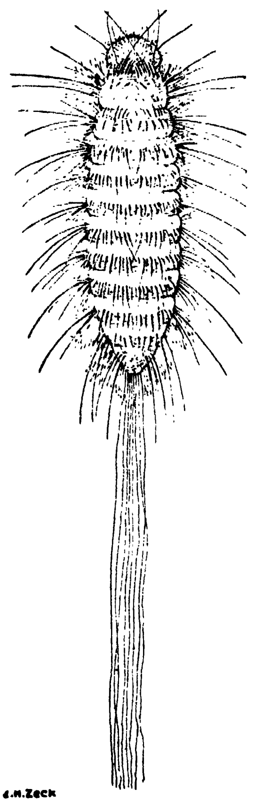
(*Anthrenus verbasci* and *Attagenus* sp.)

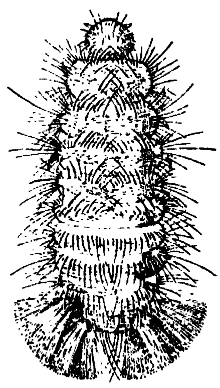
THE larvae of carpet beetles feed on various woollen household fabrics, on furs, hair and silk, upholstery and carpets. They may also infest seeds, cereal products, dried animal remains in warehouses, and also museum specimens. The larvae are more commonly found among materials or fabrics which are seldom disturbed, or in carpets and under felts which cover entire floors.

Carpet beetles pass through four stages in their life-cycle: the egg, the larva or grub, the pupal or resting stage, and the beetle or adult. The larva grows by a series of moults, and when it has become fully-fed it transforms into a yellowish pupa within its last larval skin.

The life-cycle may occupy from one to three years, the greater part of this time being passed in the larval stage. The pupae transform into adults during late spring or early summer, and these fly readily. The eggs are laid upon fabrics, in floor cracks, or in any secluded spot near their food. The habits of the two species are very similar.

The larva of the common carpet beetle measures about 3/16 inch in length. It is reddish-brown in colour, and is covered with stiff dark-brown hairs which are longest at the sides. Three segments at the tip of the abdomen each bear a pair of brushes or tufts of hairs which the larva can spread





Left: Larva of the Black Carpet Beetle.

Above: Larva of the Common Carpet Beetle.

out fanwise. The adult beetles are greyish-brown, broadly oval in outline, and measure about 1/8 inch in length.

The larva of the black carpet beetle is more elongate than that of the common carpet beetle, and bears, at the tip of the abdomen, a tuft of long hairs. The body is reddish-brown and covered with stiff hairs. Exclusive of the terminal tuft of hairs, the

Group of Larvae of the Common Carpet Beetle Feeding on the Woollen Pile of a Carpet.
[*After Back.*

larva measures up to 1/4 inch in length. The adult is small, black, broadly oval in outline, and measures about 3/16 inch in length.

Control.

In trunks, chests, wardrobes, etc., which are seldom opened, naphthalene, paradichlorobenzene or camphor may be used to prevent infestation; but in wardrobes, etc., which are in daily use, or under carpets and rugs, in pianos or upholstered furniture, these substances are of little value. As the above substances kill the carpet beetles by means of the fumes given off during slow evaporation, it is essential that where they are used the lids, doors, etc., should be tightly-fitting so that the fumes are closely confined. Naphthalene flakes or naphthalene moth balls, to be effective, should be used at the rate of not less than 1 lb. to every 8 cubic feet of space. Where camphor is used twice the quantity is necessary.

Infested carpets and upholstered furniture may be sprayed with a pyrethrum-kerosene mixture to control the larvae.

This spray may be prepared with the following materials:—

Pyrethrum powder, 4 oz.
Kerosene, 1 quart.
Methyl salicylate (synthetic oil of wintergreen), 3/4 fluid oz.

Place the pyrethrum powder in the kerosene, mix and shake well, then allow to stand for about twelve hours. Strain through fine muslin and add the methyl salicylate, after which the spray is ready for use.

DDT is not particularly effective against carpet beetles. Some of the newer insecticides are considerably more effective but as these are not available commercially no recommendation can yet be made. The use of a vacuum cleaner is of value in controlling any larvae and adults which may be feeding externally.

Fumigation with hydrocyanic acid gas is the most effective means of controlling carpet beetles when they are established throughout a building. It should be remembered, however, that hydrocyanic acid gas is one of the most poisonous gases known.

Fumigation with hydrocyanic acid gas in buildings can only be carried out by fumigators registered by the Department of Public Health under the Fumigation Regulations.

Adult of the Common Carpet Beetle.
[*After Back.*

Fumigation of individual articles with carbon bisulphide or carbon tetrachloride is effective, and this is best done out of doors. Carbon bisulphide is very inflammable and explosive, and lights of any kind must be kept away from it. Carbon bisulphide is used at the rate of 1 oz. to every 12 cubic feet of air space to be fumigated. Twice the quantity of carbon tetrachloride is necessary.

Clothes Moths

(*Tineidae*)

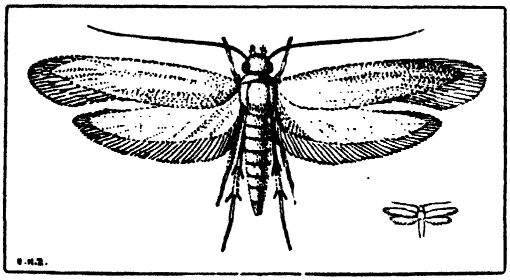
TWO species of clothes moths are commonly found in dwellings, stores, warehouses, etc. These are the case-making clothes moth (*Tinea pellionella*) and the webbing clothes moth (*Tineola bisselliella*). A third species known as the tapestry moth (*Trichophaga tapetzella*) sometimes also occurs, although less commonly.

The larvae or caterpillars feed upon wool, fur, hair, feathers and all articles manufactured from them, such as carpets, upholstered furniture, clothing, brushes, felts in pianos, etc.

The larva of the case-making moth constructs a portable case of silk and fragments of the material upon which it feeds. The larva of the webbing clothes moth spins silken tubes or tunnels and irregular masses of silken threads over the surface upon which it crawls. The tapestry moth larva constructs silk-lined galleries throughout the infested material.

Life History.

The eggs are laid singly, or in groups, either loosely upon or in the meshes of fabrics, and the larvae, if allowed to remain undisturbed for extended periods, may seriously damage the articles or substances upon which they are feeding. The larvae, when fully-fed, measure about half an inch in length. After a period in the pupal or chrysalis stage, the adult moths emerge and may be seen flying about rooms at night, usually in the darkest corners. As both larvae and adults avoid light, darkened or ill-lighted rooms provide more favourable conditions for their development.



A Clothes Moth.

Prevention and Control.

Where clothes moths have access to clothing, fabrics or woollens, these materials should not be left undisturbed for long periods. If it is necessary to store them, they should be kept in tight-fitting chests or cupboards, etc., and before storing should be thoroughly brushed or beaten and then sunned. Uninfested articles may be protected by wrapping in unbroken paper. Cold storage at a temperature of 40 to 42 deg. Fahr. will also prevent injury.

Damage Caused by the Webbing Clothes Moth.

a.—Long, narrow feeding tube spun by the larva.
b.—Place where nap has been eaten away by the larva now hidden in the silken tube.

[*After Back.*

A number of moth-proofing materials are available and of these a solution of 1 oz. of sodium fluosilicate in 1 gallon of water has been used with success. DDT and other new insecticides are being tested and may allow of considerable advances in this field.

Naphthalene flakes, naphthalene moth balls, and paradichlorobenzene are all effective for protecting clothing, etc., in chests and well-fitting trunks, but these substances must be used at the rate of not less than 1 lb. to every 8 cubic feet of space within. This will ensure perfect protection during the summer. The naphthalene should preferably be placed between the materials stored. Camphor may also be used, but twice the quantity is necessary.

In closely-fitting cupboards and wardrobes naphthalene may be used at the rate of 1 lb. to every 10 cubic feet of space within, to act as a deterrent to moths. All materials should be thoroughly brushed and sunned before being placed in the cupboards. The stored materials should be examined periodically to note any infestation and to ensure that the amount of naphthalene is kept up to the required amount. The naphthalene may be placed on the top shelf or suspended in cloth bags.

Infested carpets and upholstered furniture may be sprayed with a pyrethrum-kerosene mixture (see page 592) to kill the larvae. DDT, both in "knock-down" fly sprays, or residual type sprays may be applied to the insides of trunks, wardrobes or other storage places, and also under rugs, carpets and furniture. Brushing with a firm brush and the use of a vacuum cleaner are also of value in preventing injury. The importance of keeping floors and rugs well vacuum-cleaned cannot be over-emphasised. Particular attention should be paid to the darker corners of rooms and to sections of carpets beneath furniture.

Clothes moths normally do not eat cotton, linen or fabrics of vegetable origin, therefore articles such as sheets, pillow cases, towels, etc. do not need protection from moths and should not be stored with articles liable to attack—otherwise accidental injury may occur.

Discarded woollen clothing or woollen rags should not be left lying about floors or in corners of cupboards, as these are likely to become a source of moth infestation.

In cases of heavy infestation fumigation of individual articles or even a whole room may be necessary to eradicate the moths.

Experiments conducted over a number of years in America, by Wilson* have shown that the larvae of both clothes moths and carpet beetles can be attracted by bait materials and that infestations can be reduced by this method. In these experiments the larvae were attracted into box traps containing cloth pads treated with fish meal and placed on floors. Adult clothes moths were attracted to these lures and laid eggs on the cloth pads.

Large numbers of adult clothes moths were caught on tanglefoot fly rolls which were baited with fish oils and fish meal. Rolls baited with meat scraps also caught large numbers of clothes moths. The fly rolls were suspended in various parts of the rooms and cupboards.

* WILSON, H. F.—1940: *Journ. Ec. Ent.*, Vol. 33, No. 4, p. 561.

New Wheat Commissioner Appointed.

HON. E. H. Graham, M.L.A., Minister for Agriculture, has announced the appointment of Mr. S. C. Hodgson as Wheat Commissioner and Manager of the N.S.W. Government Grain Elevators. Mr. Hodgson has been Assistant Manager since September, 1948.

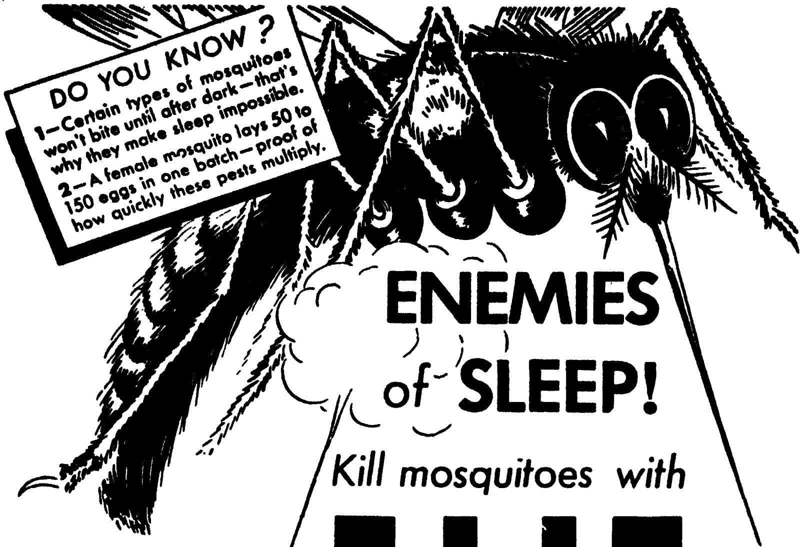
Referring to Mr. Hodgson's career, Hon. E. H. Graham said that he gained the Hawkesbury Diploma in Agriculture with Honours in 1925 and, after practical experience in the Riverina, joined the Department of Agriculture on 7th March, 1927, as an experimentalist.

Mr. Hodgson enlisted in the A.I.F. but was withdrawn on 30th March, 1942, for special duties with the Commonwealth Controller of Defence Foodstuffs. In this capacity, he was engaged in the organisation and production of large quantities of foodstuffs for the armed forces. From March, 1943, to March, 1945, Mr. Hodgson's services were made available to Messrs. Gordon Edgell & Sons, in connection with the expansion of that firm's production of essential foodstuffs for servicemen.

From 6th March, 1945, until 24th August, 1947, Mr. Hodgson was engaged in the capacity of First Assistant to the Commonwealth Director-General of Agriculture. During the absence overseas of the Director-General of Agriculture for a period of nine months in 1946, Mr. Hodgson acted as his deputy on the Wheat Stabilisation Committee, as Chairman of the Commonwealth Wheat Allocations Committee, the Feed Grain (Commonwealth Inter-departmental) Committee, the Superphosphate Industry Committee and the Vegetable Seeds Committee, as well as acting as Chairman of the Australian Standing Committee on Soil Conservation.

On his return to the N.S.W. Department of Agriculture from service with the Commonwealth Government, Mr. Hodgson was appointed Manager of Wagga Experiment Farm.

"Mr. Hodgson's wide experience in many spheres of agricultural activity have specially fitted him for the position of Manager of the N.S.W. Government Grain Elevators," said Mr. Graham. "He is a worthy successor to Mr. L. S. Harrison, who recently retired from that position."



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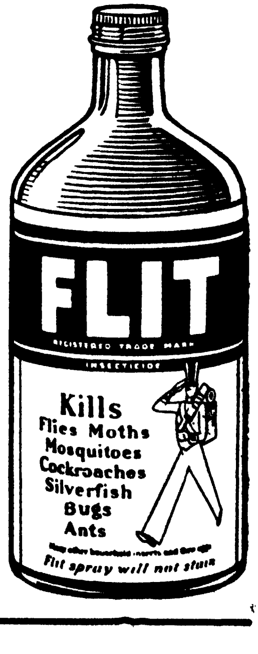

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Notes contributed by the Biological Branch

Division of Science Services

CLUB ROOT

Of Cabbages, Cauliflowers and Related Plants

THE "Club Root" or "Finger and Toe" disease of cabbages and other members of the botanical family *Cruciferae,* caused by the slime mould fungus *Plasmodiophora brassicae,* has been known to be present in New South Wales for over half a century. Although not a widespread serious disease, club root can be a limiting factor in the growing of crucifers once a section of soil has become infested with the causal organism.

Club root occurs sporadically on coastal and tableland areas of the State, but, on an acreage basis, the amount of land known to be infested with the organism is small and the disease has not spread to all the important crucifer-growing areas. Recently the disease has been recorded on swede turnips (*Brassica campestris* var. *napobassica*) in the metropolitan area.

Symptoms.

As its name suggests, the disease is evidenced by an enlargement and malformation of the root system. The tap root, secondary roots and very small roots can be affected and even the underground portion of the stem. In cabbages and cauliflowers the enlarged sections of the roots are often spindle-shaped, being thickest in the middle and tapering off to normal root width (Fig. 1). In swedes, the clubs are more spherical in shape (Fig. 2). On the enlarged tap root of the swede and on those sections of the secondary roots at or near their junction with the tap root, the clubs are of greater size and severity than those on the secondary roots farther removed from the taproot.

Roots infected with club root cannot function normally. The power of the plant to take up water and nutrient material from the soil is reduced, and the roots are attacked by a number of root-rotting organisms, eventually resulting in a decay of the whole root system. The above-ground part of the plant becomes stunted and the foliage wilts, the severity of the stunting and the amount of wilting depending on the severity of club root infection. Cabbages and cauliflowers which are only mildly infected can produce marketable heads but the market value of swedes is reduced by the presence of clubs on the root.

Club root should not be confused with root knot caused by the eelworm *Heterodera marioni* which also causes swellings

on the roots and can result in wilting and stunting of the above-ground parts. Root knot galls, do not attain the size of some of the larger club root galls. The latter are often composed of many coalesced swellings in one section of the root, whereas root

Fig. 1.—Cauliflower Affected with Club Root.

knot galls are usually individual swellings scattered more evenly over the lateral feeding roots. In addition, club root is confined to crucifers while root knot occurs over a very wide range of plants.

Control.

The club root organism can live over in the soil for many years so that every precaution should be taken to ensure that it is not introduced into previously clean land from the seed-bed or spread by surface drainage water and contaminated manure and soil.

CONTROL OF THE SEED-BED.

All care should be exercised to make sure that the seed-bed soil is free of the club root organism. If any doubt exists concerning this, the soil should be sterilised either by heat or chemical means. Where the quantity of soil required for the seed-bed is small, such soil can be baked. If facilities for steaming are available, this is an effective means of control (for details of steaming, see Plant Disease Leaflet No. 103).

Fig. 2.—Swede Turnip Affected with Club Root.

The most effective chemical treatment is the use of formalin. One part of commercial formalin is diluted in 50 parts of water and, after the soil has been loosened with a fork,

(*Continued on page* 600.)

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Production of cane sugar in 1948-49 was 949,000 tons, of which 415,000 tons, valued at over £13 million, were exported. There is a contract with the United Kingdom until 1952-53 covering the exportable surplus after local needs have been met.

The sugar industry is another of the great Australian industries which has received and will continue to receive the financial support of the Bank of New South Wales.

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LEAF CURL
Of Peach and Nectarine Trees

K. E. HUTTON, B.Sc.Agr., Assistant Plant Pathologist.

THE leaf curl disease of peach and nectarine trees, caused by the fungus *Taphrina deformans,* is extremely prevalent in most parts of New South Wales this season, and especially in the County of Cumberland.

The last two wet seasons have favoured the fungus to such an extent that it has become much more firmly established in peach and nectarine trees throughout the State. The favourable conditions for infection this spring, coupled with the temporary shortage of fungicides created by the recent coal strike, have resulted in the present epidemic of leaf curl.

Fig. 1.—Each Dormant Bud on this One-year-old Shoot Has Produced Infected Leaves.
Note the curling and puckering of individual leaves.

Symptoms.

The symptoms of this disease should not be confused with those which result from infestation by the green peach aphid (*Myzus persicae*). With leaf curl, the leaves frequently develop a bright pink colouration soon after emerging from the bud. These leaves soon commence to thicken as the tissues are stimulated to abnormal growth

Fig. 2.—Infected Leaves on New Season Shoot which is also Infected.

by the fungus growing within them. This results in the leaves becoming curled and twisted. Leaves which are completely infected lose most of their green colouring matter and become very thick and pale. These leaves are usually not curled to the same degree as partially infected leaves, which become greatly twisted because of the

Fig. 3.—Infected Current Season Shoot.
Note swelling of shoot in the form of an elongated blister at "a."

faster rate of growth of the infected parts compared with the healthy parts. All infected parts become covered with a whitish bloom, and the leaves eventually shrivel and fall from the tree. In severe cases the trees may be defoliated.

Leaves mostly become infected as they are about to emerge from the bud, hence the necessity to apply the spray for control of this disease before the buds burst in the spring. In severe cases, the fungus may grow within the developing shoot and as the new leaves are unfolded from such a shoot each one in turn in infected. Such shoot infection is common this season.

Infected shoots are swollen and stunted, pale green to yellow and may die after producing quite a number of infected leaves.

Fruits may also be attacked, the fungus causing the development of raised irregular areas, often about the size of a threepence, on the surface of the fruit. These patches develop a pink or reddish colouration long before normal fruits show any colour change.

Control Measures.

Leaf curl may be controlled more efficiently and more easily than any other disease of stone fruit trees. Only one application of spray is required and where this spray is thoroughly applied at the correct time, 100 per cent. control is commonly achieved.

Fig. 4.—"Curly-leaf" Condition Resulting from Infestation by the Green Peach Aphid.
Note the absence of thickening and puckering of the leaves. Upon unrolling such leaves, the aphids may be seen within the curled up portions. Compare with normal shoot at left and with Figs. 1, 2 and 3.

It is recommended that trees be sprayed in late winter, preferably when the buds commence to swell or just a little earlier. The spray recommended is Bordeaux mixture 15-15-100 plus ½ gallon of white oil; or lime-sulphur at the rate of 1 gallon to 20

gallons of water. Some of the proprietary lines of copper sprays such as copper oxy-chloride, will also give good control.

Fig. 5.—An Unsprayed Peach Tree Affected with Leaf Curl.

Note the extensive defoliation. Such trees cannot produce a crop of fruit and are seriously weakened.

These sprays must be applied before the buds burst, otherwise they will have little effect in controlling the disease, and furthermore they will cause serious burning of the young growth, and can lead to complete defoliation.

The "Curly-leaf" Condition Resulting from Aphid Attack.*

The leaf curl disease is sometimes confused with the "curly-leaf" condition resulting from infestation with green peach aphids. With aphid injury the leaves become extensively curled but there is no colour change and no thickening. Leaves which have been heavily infested become sticky from the honey dew excreted by the aphids, and ants are usually very active over the twigs.

Upon unrolling some of the curled up leaves the green aphids may usually be observed quite readily. However, aphids are sometimes efficiently controlled by ladybirds and hover flies, and under such conditions living aphids may be difficult to find.

* This section was prepared in collaboration with S. L. Allman, Senior Entomologist.

NEW PLANT DISEASES

DURING the six months ending 30th June, 1949, the following diseases were recorded for the first time in New South Wales:—

Achimenes sp.—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Agrostis tenuis (Creeping Bent grass).—*Sclerotinia homeocarpa* Bennett (Dollar Spot); Canberra, A.C.T.

Amphibromus neesii (Swamp Wallaby grass).—*Puccinia graminis tritici*. Pers. (Stem Rust); Bribbaree.

Aristolochia elegans (Dutchman's pipe)—virus (Spotted wilt); Metropolitan Area.

Azalea mollis (Azalea).—*Phytophthora cinnamomi*. Rands (Shoot blight of seedlings); Metropolitan Area.

Beta vulgaris (Red beet)—? Big Bud virus (Rosette); Metropolitan Area.

Brassica oleracea gemmifera (Brussels sprouts).—*Botrytis cinerea* Pers. ex. Fr. (Grey mould Blight); Yetholme.

Calendula officinalis (Marigold).— Big Bud virus (Greening); Metropolitan Area.

Callistephus chinensis (Aster).—Virus (Spotted Wilt); Metropolitan Area. (Present for many years, but not previously recorded.) *Phyllosticta asteris* Bres. (Leaf spot); Metropolitan Area.

Carica papaya (Papaw).—*Heterodera marioni* (Cornu) Goodey (Root Knot); North Coast. (?) Virus (Yellows or die-back); North Coast.

Chrysanthemum sp. (Chrysanthemum).—Virus (Spotted wilt); Metropolitan Area (present for many years but not previously recorded).

Cupressus macrocarpa (Monterey Cypress).—*Coryneum cardinale* Wagner (Canker and die-back); Orange, Oberon.

Cymbidium sp. (Cymbidium).—*Colletotrichum orchidacearum*. Allesch. (Leaf spot); Metropolitan Area.

Cynodon dactylon (Couch Grass).—*Puccinia cynodontis* Des. (Rust); Metropolitan Area (present for many years but not previously recorded).

Cyperus rotundus (Nut Grass).—Puccinia *cyperi* (Rust); Boggabilla.

Daphne sp. (Daphne).—*Phytophthora* sp. (Leaf and shoot blight of rooted cuttings); Metropolitan Area.

Dianthus barbatus (Sweet William).—Big Bud Virus (Greening); Metropolitan Area.

Festuca rubra var. *fallax* (Chewings fescue).—*Sclerotinia homeocarpa* Bennett (Dollar Spot); Canberra, A.C.T.

Fragaria sp. (Strawberry).—*Sphaerotheca humuli* (DC) Burr. (Powdery Mildew); Ebeneezer.

Freezia refracta **(Freezia).—Virus (Mosaic):** Metropolitan Area.

Hibiscus esculentus (Okra).—*Verticillium dahliae* Kleb. (wilt); Metropolitan Area.

Ipomoea plebeia.—*Cystopus ipomoeae-panduratae* (Schw.) Stev. and Sw. (White Rust); Carr's Creek, N.C.

Laburnum vulgare (Laburnum).—*Ceratophorum setosum* Kirchner (Leaf and Stem spot); Wentworth Falls.

Lasiandra grandiflora (Lasiandra).—*Armillaria mellea* (Vahl ex Fr.) Quel. (Root Rot); Nowra.

Luculia gratissima (Luculia).—*Phytophthora* sp. (Shoot Blight); Metropolitan Area.

Nerine filifolia (Spider lily).—*Phytophthora* sp. (Root Rot); Metropolitan Area. Virus (Mosaic); Metropolitan Area.

Nierembergia sp.—*Rhizoctonia solani* Kuehn (Root Rot); Nowra.

Plantago lanceolata (Lambs tongue).—*Sphaceloma plantaginis* Jenkins and Bitanc. (Scab); Metropolitan Area.

Plantago major (Plantain).—*Oidium* sp. (Powdery mildew); Metropolitan Area.

Pteridium aquilinum **(Bracken).—(?) Virus** (Fernleaf mosaic); Bathurst.

Ribes nigrum (Black currant).—*Mycosphaerella ribis* (Fuck.) Kleb. (Leaf spot); Batlow and elsewhere (present for many years but not previously recorded). *Verticillium albo-atrum* R. et Ber. (Die-back); Batlow.

Rubus fruticosus (Blackberry).—*Agrobacterium tumiefaciens* (Crown gall); Metropolitan Area.

Scabiosa sp. (Pincushion).—*Peronospora knautiae* Fckl. (Downy mildew); Metropolitan Area.

Solanum opacum (Nightshade).—(?). Spotted Wilt virus (Ring spot mosaic); Leeton.

Soja max (Soybean).—(?) Big Bud virus (Witches Broom); Glen Innes.

Stokesia cyanea (Perennial aster).—*Sclerotinia rolfsii* (Crown rot); Metropolitan Area.

Syringa vulgaris (Lilac).—*Phyllosticta* sp. (Leaf spot); Wentworth Falls.

Tristania conferta (Brush Box).—*Cercospora* sp. (Leaf spot); Metropolitan Area.

Club Root of Cabbages, Cauliflowers and Related Plants—*continued from page* 596.

the mixture is applied at ½ to 1½ gallons to the square foot depending on the quantity necessary to saturate the soil. The soil is then covered with clean boards, bagging or several thicknesses of newspaper. After twelve hours the covers are removed. The soil should be stirred several times during the next two weeks to allow the fumes to escape before planting.

Another method, less expensive but not quite as effective, is to water the seed-beds with a 1 in 2,000 solution of corrosive sublimate (1 oz. to 12½ gallons of water) just before the seeds are sown. The solution is applied at 1 pint per square foot. A second application is made when the plants are 2 inches high. *Corrosive sublimate is extremely poisonous and care should be exercised in its use.* It has a corrosive action on metal containers and should be prepared only in glass, wooden, enamel or earthenware containers. If iron or galvanised iron vessels are used, they should first be coated on the inside surface with vaseline, fat or asphalt paint.

CONTROL IN THE FIELD.

Where seedlings are transplated into land which is known to be infested with club root, the application, immediately prior to planting, of half a pint of a 1 in 2,000 solution of corrosive sublimate in each spot in which it is proposed to put a plant, has proved of value in reducing infection.

The severity of the disease tends to diminish if infested soil is not planted to cabbages and related crops for a number of years. A three- or four-year rotation should be adopted but it is advisable to keep plants of the cabbage family off infested soil for as long as possible.

LIMING.

In some cases, the severity of club root infection can be reduced by an application of hydrated lime to infested soil prior to planting. However, climatic and soil conditions determine the effectiveness of this method of control and a small trial using hydrated lime at the rate of 2 tons per acre should first be made to determine whether the disease is reduced by liming in the particular locality.

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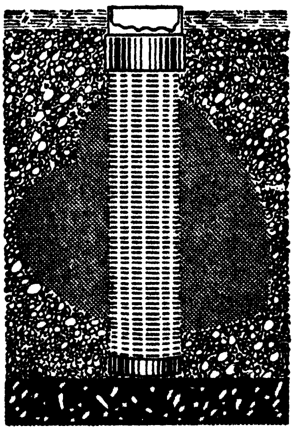

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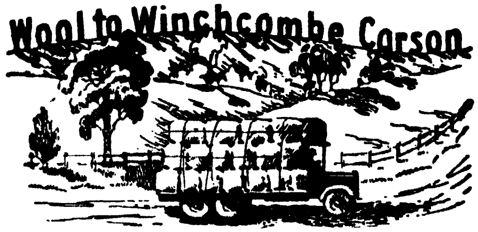

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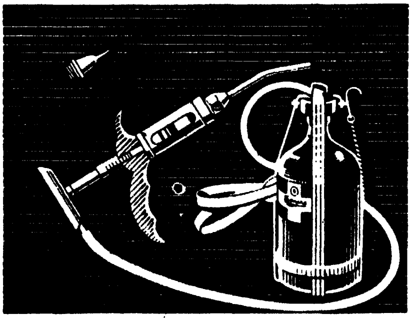

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CONTAGIOUS PUSTULAR DERMATITIS ("Scabby Mouth") IN SHEEP AND GOATS

H. G. BELSCHNER, D.V.Sc., Deputy Chief, Division of Animal Industry.

THIS is an infectious virus disease which affects both sheep and goats. It causes thick, dark-coloured scabs on the lips, and sometimes on the udders, of affected animals. Seen not commonly in lambs, it also attacks older sheep; suckling and feeding become impossible and the animals fall away in condition. In severe outbreaks death may result from starvation.

In mild cases sheep may recover without treatment and remain immune thereafter; antiseptics are only of value in the treatment of complications. An efficient vaccine is now available which will protect sheep from this disease, but its use results in infection of the property, and involves the treatment of all lambs born and all introduced sheep.

The disease is seen much more commonly in sheep than in goats. In this article it is described as a disease of sheep, but it affects goats in the same way.

The disease is not a new one, but hitherto the cause has not been properly understood, and the disease has commonly been attributed to the effect of thistles, crop stubble and other hard forms of vegetation upon which the animals have been feeding. Research work has, however, shown that the disease is an infectious one and also that it is transmissible to human beings.

Cause of the Disease.

The cause of the disease is a virus, that is, a living agent which is too small to be seen even with the highest powers of the microscope. The existence of such a living agent has been shown, however, by the fact that if some of the crusts or scabs be ground up with water, filtered and then a little of the fluid spread over an area of skin which has been scratched lightly with a needle, there results the typical scab formation seen in this disease. And from such a case the disease may be spread to other animals in a similar manner.

Fig. 1.—Sheep and Lambs Affected on the Muzzles.

Source of the Virus.

The virus resists drying and it would, therefore, seem that natural cases of the disease result from accidental inoculation of small abrasions, by scab particles which have fallen to the ground from sheep affected previously. During an outbreak, however, cases occur with such rapidity that whilst such ground infection may have been responsible for the initial cases, subsequent cases are more likely to have been due to wounding by vegetation which has been contaminated by recently occurring cases. It will thus be seen that though spines of plants, etc., are not the actual causes of the disease, they assist in its spread by making minute abrasions of the skin, and so allowing of the penetration of the virus.

Fig. 2.—Lambs Affected on the Muzzle. One also at Inner Canthus of Eye.

Symptoms.

The disease is, as a rule, not noticed until some of the animals of the flock are showing definite wart-like scabs about the lips. Actually the first indications are a slight swelling of the lips, followed by the appearance of a gummy exudate on the skin, and the rapid development of a hard scab which gradually becomes raised until a scab about ½ inch thick is present on the lips. These scabs are dark-grey to black in colour, and occur chiefly about the lips, though frequently they may be observed involving the nostrils, the area around the eyes, and at times at the coronet. Sometimes lesions are observed inside the lips, on the gums, dental pad or palate, and in these cases they appear as reddish, raised, spongy areas.

If the scabs are forcibly removed or rubbed off, a raw bleeding surface is seen. Later, however, the scabs may shed spontaneously, and in this case the underlying skin, though tender at first, quickly heals and the hair grows again.

The average time taken for the scabs to reach their maximum development is about six to eight days. Following this the scabs become detached in another six to twelve days, depending on their size.

The scabs commonly involve such a large area of the muzzle that mobility of the lips is lost, and as the animal is unable to close its lips the incisor teeth may be exposed, and it presents a picture of abject misery. Suckling or feeding is impossible and the animal falls away in condition in consequence. If blowflies are troublesome the affected parts are frequently attacked, and the discomfort of the unfortunate sheep is thereby added to. In some cases the scab seems to cause the sheep great irritation,

Fig. 3.—Ewe with Large Lesion on Udder.

and as a result of the muzzle being rubbed against the forelegs or a post, that part becomes raw and ulcerated.

When affected lambs are suckling it is not uncommon for the udder of the ewe to become affected, particularly on the teats and the nearby skin of the udder. Scabs similar to those seen on the lips are produced, but sometimes the disease takes a much more severe form and a large part of the udder may become covered with a hard, black, leathery scab. Cases have been seen where a whole quarter has become necrotic and sloughed off.

Fig. 4.—Experimental Infection of the Upper Lip.

Class of Animals Affected.

The disease is most commonly seen in lambs, but may affect sheep of any age provided they have not previously had an attack of the disease. The percentage of lambs affected in a flock is unusually high, and may be up to 90 or even 100 per cent., with a varying percentage of ewes affected on the udder.

Course of the Disease.

The course of the disease is about two to four weeks and the period of incubation from 36 to 48 hours. Many cases, especially in mild outbreaks, recover naturally without any treatment, but in the more severe outbreaks, when wart-like outgrowths occur, death may result from starvation if some form of treatment is not carried out. The disease itself is not responsible for high mortality, and recovery is brought about by the development of immunity.

Immunity.

Sheep which have recovered from an attack of the disease are immune from further infection. Sheep may be immunised artificially by vaccination, as described later in this article.

Treatment.

As this disease is contagious, affected sheep should, if possible, be drafted off and isolated. Too often, however, the disease is too well established when first noticed for this to be practicable.

Whilst the use of antiseptic dressings is of little value in the treatment of the causal virus, it will be found of value, when sheep are badly affected, to treat them with a mild antiseptic solution to deal with the complications which arise. Such antiseptic solutions as 1 per cent. lysol or similar preparation (1½ teaspoonfuls to 1 pint of water), or an astringent antiseptic dressing such as 5 per cent. bluestone (copper sulphate) mixture

(1 oz. of bluestone to 1 pint of water) may be used for this purpose. This should be followed by the application of some fatty or oily dressing to soften the scabs and thus reduce the discomfort these hard scabs cause the sheep. Sterilised unsalted mutton fat, vaseline or lard may be used for this purpose.

It is sometimes necessary to re-dress severely affected cases and advanced cases may prove more refractory.

As a rule the udders of the ewes receive sufficient treatment from contact with the dressing on the lips of the lambs.

Persons treating affected sheep should thoroughly cleanse their hands and arms with soap and water from time to time.

Prevention.

A very efficient vaccine is now available which will protect sheep from the disease. The process of vaccination, which is usually carried out on the inside of the thigh, is simple and sheep owners should seek advice from an Inspector of Stock and/or the District Veterinary Officer in this connection. Lambs may be vaccinated at marking time, but sheep of any age can be done.

Whilst the use of this vaccine has been of considerable assistance in the control of the incidence of "scabby mouth" on properties on which outbreaks are known to have occurred for some time, and in many instances has enabled the owners to escape the industrial troubles associated with this disease at shearing time, care should be taken that vaccination is not carried out indiscriminately.

This method of immunisation of the sheep against this disease involves the use of the actual living virus which causes the disease, and the scabs formed on vaccinated sheep, after falling off, remain infective for a considerable period of time. This, in effect, means that on uninfected holdings, vaccination actually introduces the disease to the property. Owners, therefore, who have once used this vaccine on their sheep will be compelled to continue to follow this procedure in respect of all introduced sheep and newly born lambs to ensure that they do not become infected with the disease which has been artificially introduced on to their properties.

Sunflowers as a Seed Crop—*continued from page 564.*

production of Advance Hybrid seed is therefore a specialised task more easily done by seed merchants than by private farmers.

Advance is very similar in appearance to Sunrise, but is a higher yielder and has larger heads. The seeds have also given a higher oil percentage.

Giant or Mammoth Russian.—This tall-growing type, which often exceeds 10 feet, has been the main variety grown in Queensland and New South Wales. However, its robust habits of growth and height make it unsuitable for mechanical harvesting with the header, though, in Queensland, special adaptations have been made to the machine to overcome the difficulty. Giant Russian is a high-yielding variety with large heads and medium-sized grey-striped to black seed. The oil content is not as high as Sunrise.

Harvesting.

Sunflowers have been successfully harvested by headers both in Queensland and in New South Wales. Certain adjustments are needed, the main one being the fitting of rubber bars to the threshing drum. Minor adjustments to the comb are also necessary to allow for increased clearance.

Yields.

Under normal conditions a yield of about ½ ton of seed per acre can be anticipated. Under irrigation yields of over 1 ton per acre have been obtained.

Diseases and Pests.

Although there are some fungous diseases and insect pests that attack sunflowers, they are generally not severe enough to affect production seriously.

The most prevalent disease is Wilt caused by the soil inhabiting fungus *Sclerotinia sclerotiorum*. This disease causes a rotting of the stalks and roots of the plant which eventually die. The only other disease of any importance is sunflower rust (*Puccinia helianthi*) which causes brown spots on the leaves.

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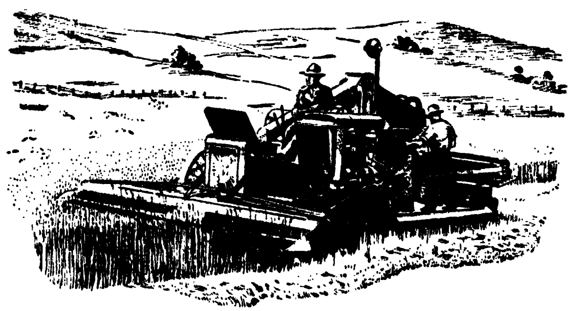

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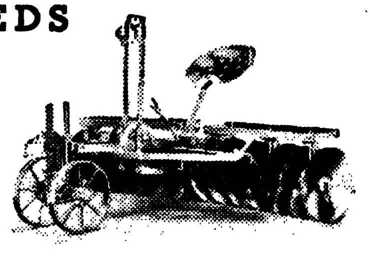

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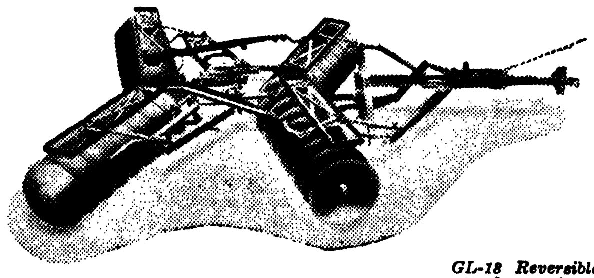

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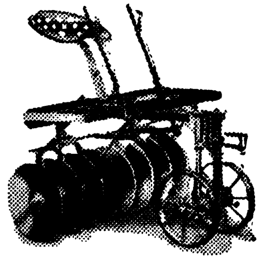

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APIARY NOTES

PREPARATION OF APICULTURAL SHOW EXHIBITS

N. A. CUTTS, Livestock Officer (Apiculture).

SHOWS provide a means by which the products of the apiary can be brought before the notice of the public. An attractive display of bees, honey, wax and honey-comb never fails to create interest, as well as provide an educational exhibit for those who visit an agricultural show. It is important that beekeepers make every effort to build up the prestige of the beekeeping industry and obtain greater publicity for apiary products, and displaying apiary products of the very best quality at local shows is an effective way of doing this.

It has been observed, with regret, that this is not always the case, as too few beekeepers enter anything in the local show and often the quality and appearance of entries are far below a standard which could be obtained with a little more time and thought given to preparing the exhibits. Perhaps the reason why there are only a few entries in the apiary section at shows, and why exhibits are often a little below standard, is lack of experience in preparing show exhibits. This can easily be remedied by practice and a study of the following hints on the preparation of exhibits.

Honey.

Honey selected for show should be of a suitable colour for the class in which it is to be entered—light, medium or dark as the case may be—so as to avoid disqualification for being out of class. It should be of good density and flavour as well as clean and bright. To assist in the brightness and clearness the honey may be heated slightly prior to being run into glass jars which have been thoroughly cleaned and polished. Holding the jar on an angle so that the honey runs down the side of the jar will prevent the formation of air-bubbles. Jars

should be of same shape and size, in fact a standard type honey jar is now being made available for exhibition purposes.

Granulated Honey.

Whether the honey be fine- or coarse-grained, the granulation should be even. Prepare candied honey well before show time so that it will be firmly set. To produce a fine-grained, candied honey, obtain a small amount of honey which is naturally candied with a fine grain, such as St. Barnaby's thistle, and introduce this into the other liquid honey at the rate of 10 lb. in 100 lb. Be sure that no granulation has commenced in the honey—by heating and allowing to cool to about 75 degrees Fahr.—before mixing in the fine-grained sample.

Flavour and colour must also be considered; usually the lighter the colour the better the sample. Points awarded for candied honey are: Evenness, 30; Firmness, 30; Flavour, 30; and Colour, 10; Total, 100 points.

Beeswax.

The most common fault in a sample of beeswax is the presence of slumgum on the bottom, and froth or scum on top.

To obtain a good sample of wax for a show, select a quantity of wax of good colour and melt in plenty of clean rain water, avoiding the use of rusty utensils. When melted withdraw the fire, cover with a couple of bags to conserve the heat, and allow to stand for about half an hour. Then carefully remove any scum and foreign matter from on top of the wax using a piece of wire gauze.

The clean wax is then gently dipped out from the top and poured into the moulds, care being taken not to dip too deeply, thus avoiding stirring up the slumgum from the bottom of the wax. It is essential that the moulds be perfectly clean, and if smeared with a little vaseline or glycerine, there should be no difficulty in removing the wax when cold. Stand the moulds of hot wax in a tray of hot water, cover and allow to set.

To prepare a good sample of white wax, select a quantity of clean, light yellow wax. When this is melted and at a temperature of a little above melting point, it is ready for the dipping board. This smooth board, which is first placed in water until thoroughly wetted, is then dipped into the hot wax and back into the water. The result is that two thin sheets of wax can be peeled from the board. The process is repeated until sufficient number of thin sheets of wax are obtained.

These are then spread out on paper in the sunlight; after several days' bright sunshine they should be perfectly white. In hot weather the wax sheets may be spread out in water contained in shallow trays. They are then melted and moulded to obtain a block of nice white beeswax.

No attempt should be made to bleach wax by the use of chemicals.

Comb Honey.

Whether comb honey is in sections or in a frame, it must be well drawn out and well capped. A comb drawn from a full sheet of foundation, evenly sealed with nice white cappings is the ideal. Combs which have been extracted once or twice are often more evenly capped than when first drawn from foundation. Nothing detracts more from an exhibit than a dark, stained frame of honey comb partially unsealed. To add to the general appearance show the comb of honey in a glass exhibition case.

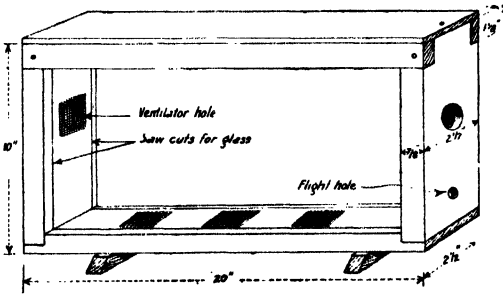

Diagram of Glass-sided Show Case for Exhibiting Bees and Apiary Products.

Queen Bee and Progeny.

The queen should be the correct colour according to the class shown, either bright, leather, or golden type as the case may be.

Size and conformation are very important in relation to the duty of egg-laying. The aim should be to select a queen having a

TRAIN TIMETABLES

New issues of both the country and suburban railway timetables will become available about the end of November. Copies will be obtainable for 6d. each at railway booking offices and bookstalls.

Everyone who travels by train should possess copies of these informative publications. In addition to including the departure and arrival times of trains, they supply a wealth of interesting information.

They contain, for instance, an alphabetical list of railway stations, the distances and fares to them from Sydney, and their height above sea level—an important consideration when selecting a place for your holidays.

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S. R. NICHOLAS,
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ATTORNEY or AGENT

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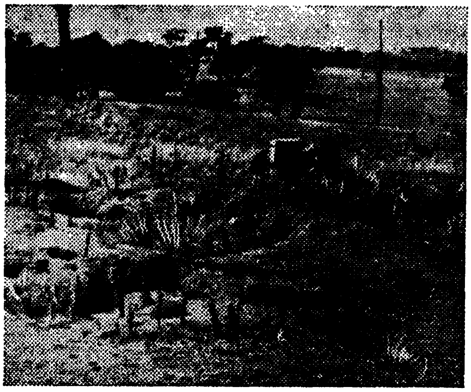
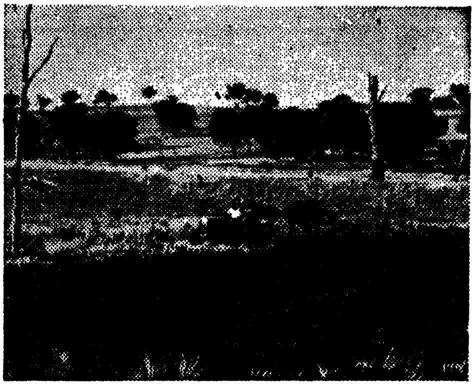
or to

The Public Trustee, 19 O'Connell Street (Box 7, G.P.O.), Sydney

P. J. P. PULLEN, *Public Trustee*



BEFORE — Three years previously this heavily infested warren had been laboriously dug out by hand. The photo clearly shows how rabbits had opened up the warren again and eaten out the surrounding area.



AFTER — The entire warren permanently destroyed and ploughed in. A Ferguson direct-attached Tiller or Scarifier has been used after ploughing to work down the area ready for sowing pasture grasses.

ORANGE WOOLGROWER

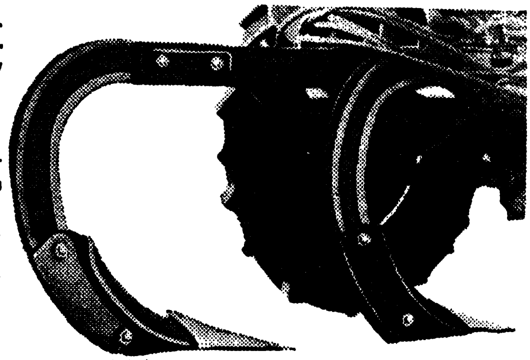
CLEANS OUT RABBITS

WITH THE **FERGUSON** SYSTEM

Mr. R. G. Rutherford, of "Ingledoon", Cheesemans Creek, via Orange, N.S.W., uses Ferguson Tractor and Implements to destroy warren 60 x 40 yds. in matter of hours.

THE EQUIPMENT

A Ferguson Tractor with hydraulically controlled 2-furrow mouldboard plough. This is first used to scratch a poison trail about 1" deep at 3 m.p.h.! After surface poisoning the plough is stripped of mouldboards, coulters and rear furrow wheel. Special ripper shares of hard steel are then fitted and the Ferguson equipment is ready for the first ploughing down to 16" depth. A further cross ploughing penetrates 24" to the beam and destroys both harbour and rabbits. Any minor break throughs can be simply dealt with by commercial fumigants or carbon monoxide from the tractor exhaust. *This is your COMPLETE answer to the rabbit pest at a fraction of the cost of less effective methods.*



Over 400 N.S.W. graziers have destroyed rabbits the Ferguson way.

BRITISH FARM THE FERGUSON SYSTEM **EQUIPMENT CO.**

(DIVISION OF STANDARD CARS LTD.) 83-89 FLINDERS ST., SYDNEY

F80/240

wide thorax denoting strength, with well-developed legs attached, capable of carrying herself smartly over the combs even when heavy with eggs. The wings should be carried folded neatly along the back, not spread out. The abdomen, perhaps the most important part, should be large, well-shaped, having width and depth, thus giving a good capacity of egg production. Queens with short, small or narrow abdomens, should be avoided.

Not only is the queen herself important, but care and attention must be given to the selection of a queen whose progeny is up to standard, as 40 points are awarded under this heading for the queen and her progeny. Very often a queen will have the necessary outward appearances, but her worker progeny bar her for show, the bees being uneven in size or in colour markings, or both. The queen's progeny should be large, even-sized bees and evenly marked both on top and underneath the abdomen. Not all queens will have all their progeny even, and what appears to be an evenly marked lot of bees from on top of the abdomen, will give a wide variation when examined beneath the abdomen.

Show the bees on a good comb provided with sufficient honey, and in a well ventilated exhibition case (see illustration). Unless ample ventilation is provided the bees become overheated, which has an adverse effect on their general appearance.

It is to be hoped that in forthcoming shows more beekeepers will endeavour to submit entries so as to make larger and more attractive displays in the apiary sections.

Some Details of Queen Bee Mating

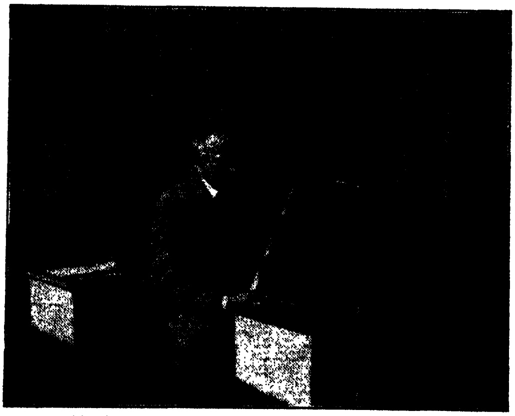
Observations by Mr. E. W. Robertson

Mr. E. W. ROBERTSON, a bee-keeper whose home apiary is at Chatswood and who has bees at Arcadia, is a keen observer of bee behaviour. On previous occasions he has communicated interesting observations to the Department and reference has been made in Apiary Notes to some of his experiences.

He has now made available details of some observations in connection with the mating flights of queen bees and of subsequent events leading up to the time when these young queens are capable of laying fertile eggs in brood combs to produce worker bees.

Describing these observations Mr. Robertson writes:—

"A queen cell given to a nucleus colony on 8th December (afternoon), due to emerge any time between late that evening or early on 9th, was mated during the afternoon of 16th December—roughly eight days. She was observed to leave the nucleus three times between 1.30 and 3.48 p.m. How many previous pre-natal flights she made other than these could not be determined as I only made periodical visits, staying from 5 to 10 minutes; but whenever she was seen to leave I waited for her return. However, at 3.48 p.m. she quietly flew out and returned mated at 4 p.m. I then promptly



Mr. E. W. Robertson at Work in His Apiary.

opened up her nucleus hive and observed her get rid of the effete organ, which she managed in 11 minutes.

(Continued on page 614.)

POULTRY NOTES

CLEAN UP THE REARING EQUIPMENT

E. HADLINGTON, Principal Livestock Officer (Poultry).

NOW that the hatching season is completed, one of the most important considerations is to clean the chicken pens thoroughly as the chickens are moved from one stage to another. When the last chickens are transferred from the brooders, the brooders and runs should all be cleaned and sterilized.

Owing to the prevalence of coccidiosis during this season it is more than ever necessary to ensure that the chicken pens are left in a sanitary condition.

The procedure which should be followed is to scrub the walls of the brooders and floors, also drinking vessels and feed troughs, with a solution of caustic soda at the rate of 1 lb. to 5 gallons of water, preferably hot. It is essential that care be taken in handling the caustic soda, as it may burn the skin and cause injury to the eyes.

Where there has been an outbreak of coccidiosis, it is advisable to remove an inch or two of the top soil of the outside runs, and leave the surface exposed to the weather for some months before refilling with new soil; but in any case the runs should be thoroughly scraped and left open to the weather. It is desirable also to keep the runs free of grass and weeds for several months so that the sun can shine on the surface.

The same procedure should be followed in the case of small weaning pens as soon as they are emptied.

Later on when the pullets are transferred from the colony yards to the laying quarters, the houses should be cleaned and disinfected, and any parts of the run which are bare and covered with manure should be scraped or swept before the pens are spelled until next season.

By adopting these sanitary measures much can be done to prevent disease outbreaks among chickens each season. To be effective the work should be carried out without delay after the pens are emptied for the season. In cases where action is delayed from week to week, the ground becomes impregnated with bacteria, especially if overgrown with weeds, etc.

AUSTRALIAN AUSTRALORP STANDARD

SINCE the inauguration of the Poultry, Pigeon and Cage Bird Club of New South Wales about three years ago, the setting up of an Australian-wide standard for the Australorp has been under consideration. A sub-committee was formed to go into the matter of preparing illustrations and revising the standard.

Australorp bodies in other States were contacted and a meeting of representatives was held at the 1949 Sydney Royal Agricultural Society's Show, when agreement was reached except for minor details. A further meeting was held at the Melbourne Royal Agricultural Society's rooms during the currency of the recent Show and after making a few small alterations in the standard and scale of points, complete agreement was reached.

It is hoped that the standard, as accepted, will be adopted throughout the world for this breed and thus end the confusing position of having many different standards for the same breed.

The complete standard together with illustrations is given below:—

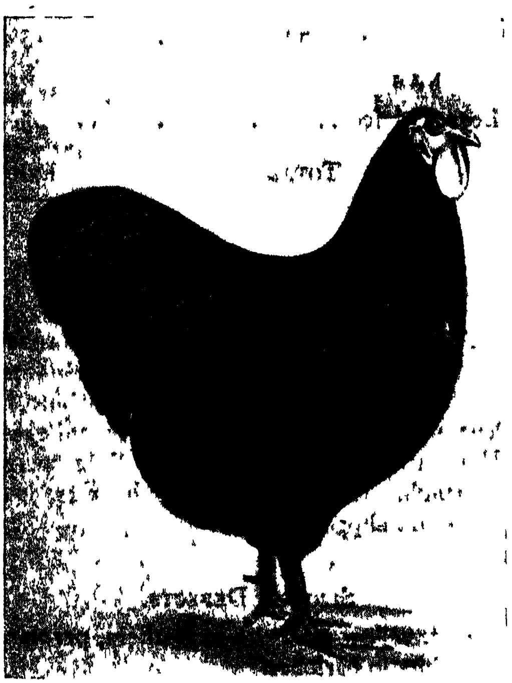
AUSTRALIAN AUSTRALORP STANDARD.

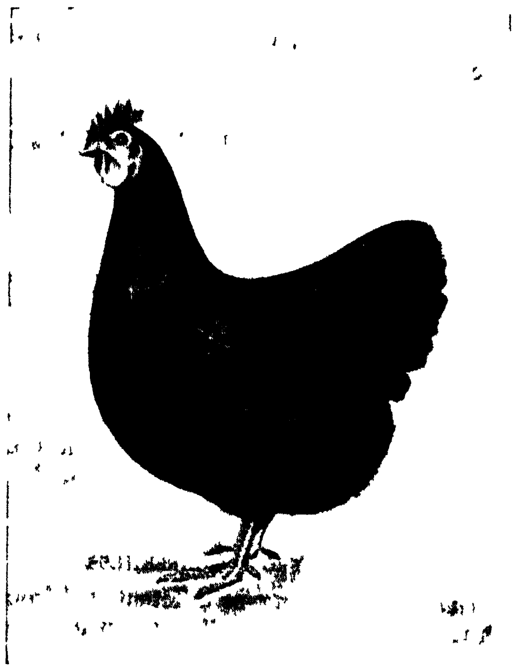
GENERAL CHARACTERISTICS.

The Male.

TYPE.—Body deep and broad, showing somewhat greater length than depth. Breast full and rounded, carried well forward without bulging; breast bone long and straight. Back broad across shoulders and the saddle, with a sweeping curve from neck to tail.

HEAD.—Finely modelled with skull rounded. Beak slightly curved, strong and of medium length, black in colour. Eyes large, prominent and expressive; high in skull standing out well when viewed from front or back; colour black or dark-brown iris; black preferred. Face full, fine in texture, clean, free from feathers and wrinkles and overhanging brows; colour bright red. Comb single, medium in size, erect, evenly serrated (four to six serrations)





and blade tending downwards without touching the neck, texture fine, but not of glace appearance. Wattles medium in size, rounded at bottom and corresponding in texture to comb. Ear lobes, small and elongated, colour red.

NECK.—Fairly long, fine at the junction of head, with a gradual outward curve to the back, widening distinctly at the shoulders.

TAIL.—Full and compact, rising gradually from the saddle in an unbroken line; the sickles in the male gracefully curved, but not long and streaming.

WINGS.—Compact and carried closely in, the ends being covered by the saddle hackles.

LEGS.—Medium in length, strong, bayonet-shaped, and spaced well apart. The hocks being nearly covered by body feathering; and the whole of the shanks showing below the underline. Shanks and feet (four toes) black, with white soles, and free from feathers or down.

SKIN.—White and fine in texture.

PLUMAGE.—Black with lustrous green sheen; feathering soft but close, with a minimum of fluff, only sufficient to cover the thighs.

CARRIAGE.—Erect and graceful, denoting an active fowl, the head being carried well above the tail line.

The Female.

The general characteristics are similar to those of the male, allowing for the natural sexual differences. The pelvic bones should be pliable, not showing an excess of fat or gristle; the abdominal skin being pliable, without an excess of internal fat. All these parts to be of fine texture; any indication of coarseness should be discountenanced.

FREEDOM FROM COARSENESS.

(*a*) Shanks strong, as differentiated from either extreme coarseness or fineness of bone.

(*b*) Pelvic bones strong at the base—long and straight to be as free as possible from gristly covering. (Undue importance not to be attached to (*b*) in male birds.)

(*c*) Abdomen to be elastic, avoiding sagging down or hardness indicating excess fat; skin to be fine and pliable.

MINIMUM WEIGHTS.

Minimum weight of cock ..	8 lb.
Minimum weight of cockerel..	7 lb.
Minimum weight of hen ..	6 lb.
Minimum weight of pullet ..	5 lb.

One half to one pound heavier preferred, but if in excess to be cut correspondingly.

SCALE OF POINTS.

	Points.
Type	35
Head (eye, 10; face, 5; skull, 5; comb and wattles, 5)	25
Plumage (colour, quality and character of feathering) ..	12
Freedom from coarseness	15
Condition	8
Legs and feet..	5
TOTAL	100

DEFECTS FOR WHICH BIRDS SHOULD BE PASSED.

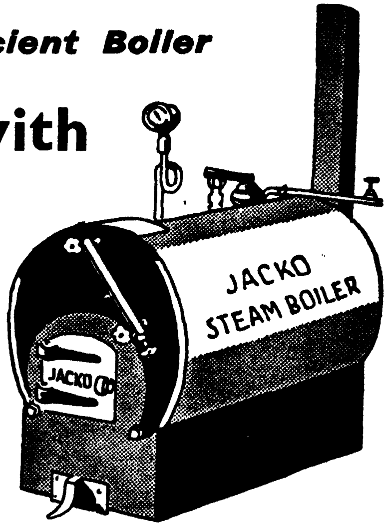
Any deformity such as wry tail, roach back, crooked breast-bone, crooked toes, webbed feet. Yellow or willow colour in legs or feet. Yellow- or pearl-coloured eyes. Feathering on shanks or feet. Side sprigs on comb. Under weight. Split or twisted wing and slipped wing.

SERIOUS DEFECTS.

Red, yellow or white in feathers, permanent white in earlobes.

The World's most efficient Boiler

PLAY SAFE with JACKO



Jacko Boilers with sturdy quarter inch boiler plate, Galloway tubes, and high grade mountings, emerged with flying colours from new rigid Government tests.

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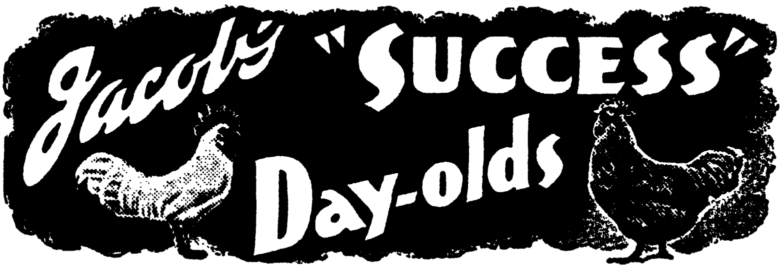

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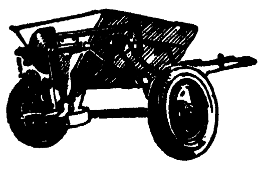
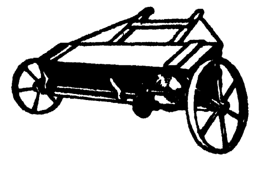
Horse drawn or trailer types or steel or pneumatic wheels, and models for erection on motor truck or farm waggon. Adjustable spread from 10 to 30 feet. Featuring famous Crump chain feed and friction disc drive. No cogs or stars, no choking or delays.



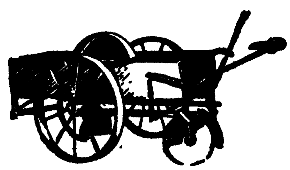
DIRECT DROP SPREADERS

Widths of up to 17 feet on steel or pneumatic tyre wheels for horse draught or truck haulage. All sizes in "speed" models for motor truck attachment. Famous Crump chain feed. No cogs or stars. Slow moving parts. Special types for orchardists and market gardeners.
Crump top-dressing machines sow grain with or without fertilizer, and grass seed with fertilizer, evenly, quickly and economically.



INDEPENDENT POTATO PLANTERS

Automatic single row planters complete with Crump fertilizer enables one man to space, plant and distribute manure in one operation. Planters also available for attachment to ploughs. Needle disc and chain feed action sows from 3 to 4 acres a day with scarcely a miss.



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LIST OF QUALIFIED CHICK SEXERS

Owing to the limited number of applications received this year, only one chick sexing examination was conducted by the Department. Six candidates attended and one qualified for a First Class Certificate.

The following is a list of holders of certificates issued by the Department, including the candidate who qualified this season.

Special Class Certificates.

Mr. F. D. Evans, Leamington-street, Dundas.

Mr. S. W. Leach, Windsor-road, Baulkham Hills.

Mr. A. L. B. Newton, Blacktown.

Mr. N. B. Davies, Garnet-road, Miranda.

Mr. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. R. W. Druce, Old Prospect-road, Wentworthville.

Mr. R. A. Percival, 135 Longueville-road, Lane Cove.

Mr. S. Martin, Duggan Farms, Blacktown.

Mrs. O. B. Johnson, 52 Dickson-avenue, West Ryde.

Mr. S. G. Olsson, Western-road, Wentworthville.

Miss B. B. Brown, Green's-avenue, Dundas.

Mr. J. Edwards, 106 Ballandella-road, Toongabbie.

Mr. C. R. Sims, 5 Millar-street, Drummoyne.

Mr. H. D. Brown, Braeside-road, Wentworthville.

Mr. G. A. Lee, 60 Beaufort-street, Croydon Park.

Mr. R. G. Amies, Windemere-avenue, Northmead.

Mr. K. L. Moore, 22 Collaroy-street, Collaroy.

Mr. B. J. Dawson, Withers-road, Kellyville.

Mr. A. Pamment, 75 Harris-street, Guildford.

Mr. A. E. Sutton, 65 Bungaree-road, Wentworthville.

First Class Certificates.

Mr. A. A. Tegel, Leppington.

Mr. C. R. Badman, Mackenzie-street Revesby.

Mr. J. R. Kilborn, 9 Denman-street, Eastwood.

Mr. E. Marchant, Melbourne, Victoria.

Mr. W. Evans, Leamington-street, Dundas.

Mrs. F. D. Evans, Leamington-street, Dundas.

Mr. C. C. Green, 82 Carlingford-road, Epping.

Miss V. Wilson, Box 249, P.O., Newcastle.

Mr. H. Jacobs, Vimiera-road, Eastwood.

Mr. I. A. Hazlett, Ingleburn.

Mrs. A. Brakell, Church-street, Carlingford.

Mr. K. Gibson, Wensley House, Stanford Park-road, Mt. Roskill, Auckland, New Zealand.

Mr. Gordon Thomson, Opoho, Dunedin, New Zealand.

Mr. J. H. Turner, Hotham-road, Sutherland.

Mrs. T. M. Brown, Main-road, Kearsley, via Cessnock.

Mr. J. Herrman, 86 Station-street, Fairfield.

Mr. H. Wallaste, Grantham-road, Plumpton.

Mr. O. Van Stappen, Pacific Highway, Wyong.

Mrs. H. M. Leach, Windsor-road, Baulkham Hills.

Mr. A. M. Smith, Richmond-road, Blacktown.

Mr. A. H. Baker, 13 Marion-street, Harris Park.

Mr. R. Pitt, Government-road, Weston.

Mr. O. Korting, Bid-a-wee Poultry Farm, Quaker's Hill.

Mr. R. O. J. Clucas, Excelsior-avenue, Castle Hill.

Mr. K. J. Fooks, Tomah-street, Carlingford.

Mrs. Z. Jacobs, Kildare-road, Doonside.

Mr. N. Long, Ferndell-street, Guildford.

Mr. R. Lockyear, Hurt-street, West Wollongong.

Mr. G. E. Mahon, Kings-road, Ingleburn.

Mr. R. J. Mayjor, 106 Ballandella-road, Toongabbie.

Mr. F. S. Wrigley, 1 Blencairn-avenue, Caulfield, S.E. 7, Melbourne, Victoria.

Mr. R. Clark, Bay-road, Arcadia.

Mr. S. G. Gibson, Richmond-road, Marsden Park.

Mr. R. Watson, 4 West Terrace, Bankstown.

Mr. R. C. Parkin, 3 O'Neil-street, Granville.

Miss N. Nall, Herring-road, Eastwood.

Mr. D. Melville, c.o. Leach's Hatchery, Windsor-road, Baulkham Hills.

Mr. J. R. Clucas, Old Northern road, Castle Hill.

Mr. C. M. Whitehead, Addison-road, Manly.

Mr. W. G. Savage, Oak-road, Sutherland.

Mr. R. W. Halpin, Wyena-road, Pendle Hill.

Second Class Certificate.

Mrs. W. J. Hanley, 219 Princes Highway, Charlestown.

Standards for Certificates.

Particulars of the standards for the various certificates are as follows:—

For a Special Class Certificate, it is necessary to sex 300 White Leghorn chickens in 45 minutes with 98 per cent. accuracy, without killing or injuring a chicken.

For a First Class Certificate, 200 White Leghorn chickens must be sexed in 30 minutes with an accuracy of 95 per cent. Not more than one chicken can be killed or two injured without disqualification.

The Second Class Certificate, which has now been discontinued, was introduced as a wartime measure in order to enable more sexers to qualify to meet the increased demand. The standard was the same as for First Class except that 50 minutes were allowed for sexing the 200 chickens. Several candidates qualified for this certificate and later gained First Class Certificates.

The Position Regarding Sexers.

Although there are sufficient sexers to cope with most of the sexing work in the main commercial poultry farming centres of this State, there are still some small farmers who are not able to obtain the services of sexers owing to distant location of the farms, and even if more sexers were available the cost of transport would render it difficult to meet the requirements of these scattered farms and hatcheries.

It is probable that larger numbers of chickens will be hatched next year to make up for the reduction in hatching this season due to the coal strike, thus there should be employment for all qualified sexers.

Facilities for Learning Chick Sexing.

If there are sufficient applicants, classes of instruction in chick sexing are usually held in the autumn by one of the leading sexers, who is sponsored by the Chick Sexers' Association. It should be realised, however, that in addition to attending classes, which extend over three months, it is necessary to have intensive practice on some thousands of chickens before a candidate can expect to qualify for a certificate.

Good eyesight and deft fingers are essential to expertness in the art of chick sexing; thus youth is necessary for the highest efficiency. Few people over the age of thirty years when commencing have reached the highest standards, and many younger candidates have attended four to six examinations before qualifying.

It will, therefore, be seen that it is not easy to master the art of sexing—and the cost can be very considerable, especially if chickens have to be bought for practice.

Holden owners tell their story

Letters are coming in from Holden owners from every part of Australia. Extracts from a few of these letters are reprinted here, and they give convincing proof that Holden stands up to all the claims made for it.

"Corduroy no nightmare . . . potholes merely a nuisance."

". . . A few trips in particular are worth mentioning—Brisbane to Coolangatta, 43 m.p.g.—Brisbane to Esk with six passengers, 31 m.p.g.—and Brisbane to Gympie, 40 m.p.g. This latter trip includes 37 miles of very poor surface. The car at the present time is averaging for all types of driving 33-35 m.p.g. . . . This car's ability to dampen out the worst of roads is well worthy of mention. Corduroy is no longer a nightmare and pot-holes merely a nuisance. The seats could not be more comfortable . . . in 30 years' motoring I consider the Holden my best 'buy' and the best value offering today."

(*sgd.*) *T. V. W., Albion, Q.*

★ ★ ★

"The car will cruise all day at . . . 65-70 m.p.h."

". . . I have kept accurate records of running expenses and can only describe the economy of the car as phenomenal; petrol consumption for 6,000 miles has been 204 gallons —an average of 29.41 miles per gallon . . . More than 3,000 miles have been driven at high speed on interstate journeys and I find that the car will cruise all day at a perfectly comfortable 65 to 70 m.p.h. if required . . . I recently covered approximately 1,000 miles of severely pot-holed and corrugated road in Western N.S.W. at a steady 60/65 m.p.h. and found the comfort, dust-proofness and general road-worthiness of the car to be astounding . . ."

(*sgd.*) *K. L., Pt. Melb Vic.*

★

"Combines all the features I require"

". . . I have owned many fine cars but have yet to own one that combines all the features I require. The Holden does this . . . its most outstanding feature is its outstanding economy which has worked out at 31 m.p.g. for all running."

(*sgd.*) *P. B. M. W., Boyup Brook, W.A.*

★ ★ ★

"Holden was the only vehicle . . . to get through"

". . . an average of 30 m.p.g. over bad roads, hilly in places, I am more than satisfied with the Holden as an all weather car. During July's heavy fall of snow the Holden was the only vehicle, including trucks, to get through from Adaminaby to Cooma when the snow was at its heaviest—approximately 8 inches in depth . . ."

(*sgd.*) *P. J. S., Adaminaby, N.S.W.*

★ ★ ★

"Used for Droving Sheep"

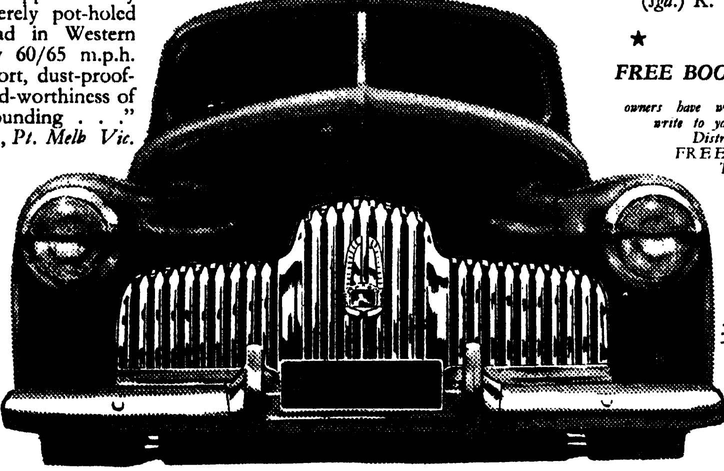
". . . I am full of praise for the outstanding performance of my Holden. The petrol consumption is remarkable as, over the whole period, I have averaged 33 miles per gallon, which on . . . occasions the car has been used for droving sheep, and general paddock work..."

(*sgd.*) *R. H. F., Kadina, S.A.*

★

FREE BOOKLET

Read the letters Holden owners have written themselves. Call or write to your nearest General Motors Distributor or Dealer for the FREE booklet—"Holden Owners Tell Their Story".



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Keep mastitis in check with thorough cleaning and sterilizing in the milking shed.

Wash udders with soapy water, dip teat cups and teats in Sodium Hypochlorite Solution.

Before milking, flush milking machines, coolers, cans, etc. with Sodium Hypochlorite. After milking, clean all equipment by the well known methods.

Clean first THEN sterilize

SODIUM HYPOCHLORITE

(12½% Available Chlorine Solution) is the recommended Sterilizer. Where Sodium Hypochlorite is unobtainable, or small quantities of sterilizer are required over a long period, use "Zanic" Sterilizer "C" Powder.

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Contact your local butter factory or usual supplier.

G5-FA

Tubercle-free Herds

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm	63	11/7/50
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus, A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys)	114	14/3/50
Hawkesbury Agricultural College, Richmond (Friesians)	35	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
Limond Bros., Morisset	67	25/7/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	90	15/7/50
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	77	22/8/51
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50
Perry, E. L., Shane's Road, via St. Mary's (Jerseys)	67	31/5/50
Police Boys' Club, Camp Mackay, Kurrajong (Jersey and A.I.S.)	26	1/7/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road, Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus)	38	19/8/50
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	25/7/51
Scott, A. W. "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	42	30/5/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	165	1/7/51
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	64	21/5/50
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Andrews, G. M., "Mulla Mulla" Grove, Wollombi	56	8/8/50
Australian Missionary College, Cooranbong (Jerseys)	96	19/8/49
Barnardo Farm School, Mowbray Park	48	15/7/50
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cagney, J. M., Yanco Creek, via Wollombi	45	15/8/50
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colley, A. G., "Heatherbrae," Swanbrook Road, Inverell	30	28/7/51
Coote, B. N., Auburn Vale Road, Inverell	38	28/7/51
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	13	6/6/50
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell	102	16/8/51
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	18	31/5/50
Grant, W. S., "Monkittee," Braidwood	20	2/7/50
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	53	1/6/51
Hart, K. H., Jersey Vale, Armidale	25	8/10/49
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	71	28/7/50
Koyong School, Moss Vale	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lott, J. H., "Bellevue," Rob Roy, Inverell	45	8/7/51
Lowe, W. W., Booral, via Stroud	73	12/3/49
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
McCosker, Estate E., "Bannockburn Station," Inverell	64	8/7/50
McGrath, B. J., Clyde Rd., Braidwood	39	8/9/50
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B., "Mount View," Cessnock	93	18/7/51
Marist Bros. College, Campbelltown	70	18/2/50
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	34	17/3/50
Parker Bros., Hampton Court Dairy, Inverell	145	27/8/49
Peat and Milson Islands Mental Hospital	27	30/8/50
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Pyne, H. W., Cedar Creek, via Millfield	26	16/8/50
Rolfe, A. E., "Avon Dale," Inverell	23	8/7/50
Rolfe, C. D., "Rose Farm," Inverell	31	17/3/50
St. John of God Training Centre, Kendall Grange, Lake Macquarie	10	4/7/51
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead	27	22/8/51
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree	60	1/4/50
Sternbeck, P. J., Millfield	32	16/8/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Tanner, F. C., Dural Rd., Armidale... ...	42	8/10/49
Thompson, K., Yallambi, via Wollombi ...	90	8/8/50
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	8/10/49
Tosh, W. K., " Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., " Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., " Spring Hills," Camden	61	7/12/49
Waddell, W., " Afton," Oakwood Rd., Inverell	125	8/7/50
Waters, A., Marsh Street, Armidale... ...	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	52	8/11/49
Williams, L. B., " Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, " Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis:—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
nverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Indus ry.

Some Details of Queen Bee Mating—*continued from page* 607.

"I have frequently witnessed queens rid themselves of these organs by dragging them loose on the edges of the cells of a tough comb. It usually takes a queen about 12 minutes to free herself of the now useless drone organ. In the instance under review, when the queen had worked it loose, she made a lightning stroke with a hind leg and dragged it free and it was promptly seized by a worker bee, no doubt to be thrown out of the hive.

"Although on several occasions I have watched queens get rid of this effete organ by working it loose on the cells, I have never before seen a queen deliberately kick it free after loosening it. Perhaps it may be usual, but the action was so quick it may not have been noticed before.

"Incidentally a few weeks ago I watched several queens fly out. They were of the same age and in a row of nuclei. I saw one unsuccessful flight made from one nucleus, six from another, and seven unsuccessful flights from a third nucleus hive. Unfortunately I did not see the last queen go out on at least an eighth flight to time her, having left the area for about 15 minutes, but saw her return mated.

"During my careful study of this matter of mating I find that queens normally mate on the eighth day, but during bad or even strong windy days, the time may vary considerably. The three cases cited above were thirteen days old, but for days we had very windy weather."

SEVERAL imported boom-spraying outfits now in operation in Batlow orchards are creating much interest amongst local fruitgrowers. Growers who are using this method of spraying consider it to be highly efficient.

The speed of travel depends on the size of the trees, but averages from 1.75 to 2.5 miles per hour. A pump with an output of at least 20 gallons per minute is required for a boom.—DIVISION OF HORTICULTURE.

Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	64
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)	29
Evans, C. A., & Sons, "Bong Bong," Moss Vale	58
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla," Culcairn (A.I.S.)	38
Hurlstone Agricultural High School, Glenfield (Ayrshires)	69
McEachern, H., "Nundi," Tarcutta (Red Poll)	53
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	39
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)	36
New England University College, Armidale (Jerseys)	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	111
Quickenden, P. W., "The Knoll," Bundanoon (Jerseys)	9
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	52
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus)	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	114
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	39
Scott, A. W., "Milong," Young (Aberdeen-Angus)	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Sydney Church of England Grammar School, Moss Vale	43
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
Walker, J. R., "Strathdoon," Wolsley Park	67
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	232
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	64
Yanco Experiment Farm	54
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	56
Honner, A. T., Moorna Pastoral Co., Wentworth	27
Kenmore Mental Hospital	63
Morisset Mental Hospital	60
Mt. Penang Training School, Gosford	31
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	27
Prison Farm, Emu Plains	127
Rydalmere Mental Hospital, Rydalmere	35
Salway, A. E., "Coolagalite," Cobargo	57
St. John of God Training Centre, Morisset	8
State Penitentiary, Long Bay	15
Von Nida, F. E., "Strathgarve," Wildes Meadow, via Moss Vale	32

W. L. HINDMARSH, Chief, Division of Animal Industry.

Pullorum-tested Flocks

THE following is a list of flocks which have complied with the Department's Accredited Pullorum-tested Flock Scheme, and which are tested regularly for pullorum disease :—

Name and Address of Owner.	Breeds.
Clucas & Sons, J. E., "Bellevue" Hatchery, Old Northern road, Castle Hill.	Australorps, White Leghorns, Rhode Island Reds.
Hawkesbury Agricultural College, Richmond	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Turkeys.
Juniel, E., Mrs., Kings-road, Ingleburn	White Leghorns, Australorps.
Kennedy, F. J., "Kenwood," Orchard-avenue, Model Farms.	Australorps, White Leghorns.
Phippard, H. L., Bobbin Head road, Turramurra	Rhode Island Reds, White Leghorns.
Seven Hills Poultry Experiment Farm, Seven Hills.	Australorps, White Leghorns, Chinese Langshans.
Wagga Agricultural College and Experiment Station, Bomen.	Australorps, White Leghorns.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Road, Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Draper, R. E., " Glengar," Capertee.
" Endeavour " Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., " Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Police Boys' Club, Camp Mackay, Kurrajong.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Wagga Agricultural College and Experiment Station.
Walker, J. R., " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Williams, G. R. B., " Tyreel," Agnes Banks, via Richmond.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Fraser, S. M., " Springvale," R.M.B. 906, Inverell.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Excellent Herd Improvement Results at Tamworth.

THE 1948-49 yearly figures covering production of dairy cows tested under the Department of Agriculture's Grade Herd Recording Scheme in the Tamworth-Quirindi area, have shown clearly that Tamworth dairy farmers are highly efficient producers of milk and butterfat.

In seventeen dairy herds tested over the period, 475 cows concluded 180- to 270-day milking periods with an average milk production per cow of 4,803 lb., and an average butterfat production of 227.3 lb.

Viewed against the State butterfat average of approximately 150 lb. per cow, these figures show herds under test in the Tamworth district in a very good light.

The main features behind the high-production figures are provision of sufficient quantities of milk-producing foodstuffs throughout the year, selection and heavy culling of cows according to records, and use of sires of proved high-production strains.

Dairy farmers in Tamworth Sub-unit No. 1 of the Herd Recording Movement are to be congratulated on the excellent results obtained.

Castration of Pigs.

CASTRATION of male pigs raised for marketing is essential. Castration enables the farmer to control breeding operations at his piggery, and the castrated animal yields a carcase of better quality, free from sexual flavours and odours.

The best age for castration is four to six weeks, while the pigs are still being suckled by their dam. At that age there is considerably less shock to the nervous system and the growth of the pig is not checked. The older the pig, the greater is the shock and risk, and the more severe the after-effects.

For a full and illustrated description of the correct methods of castration, write to the Division of Information and Extension Services, Department of Agriculture, Box 36, G.P.O., Sydney, for the departmental leaflet, "Castration of Pigs," which is available free on application.

THE AGRICULTURAL GAZETTE FOR DECEMBER, 1949

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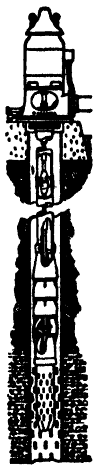

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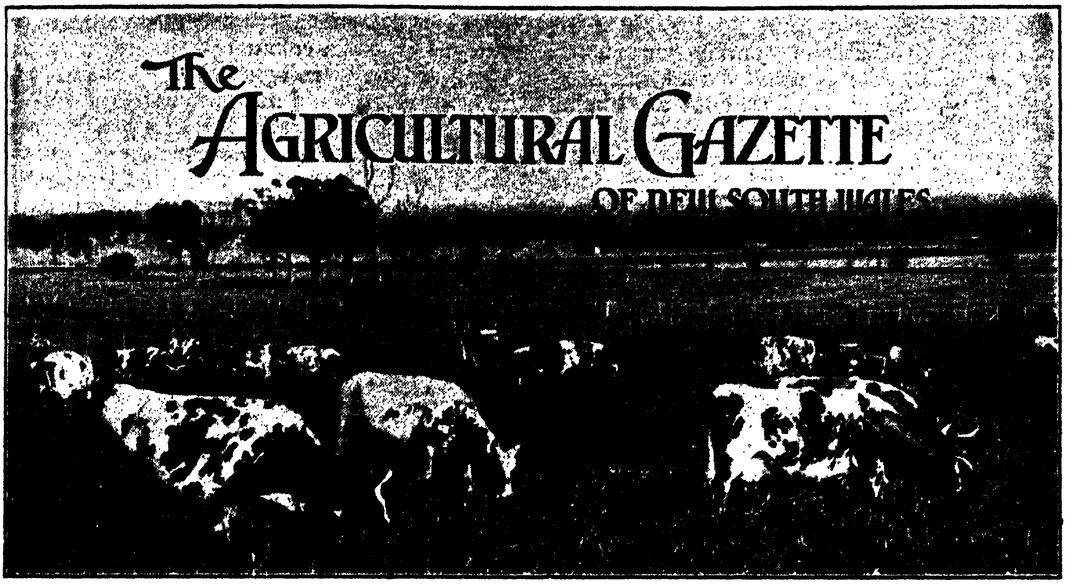


Editorial—

YELLOW-GREEN PASTURES

●

"YELLOW-GREEN" best describes the present-day colour of north coast dairy pastures. It's a sickly green, lacking the darker green colour associated with pastures growing on fertile soils. Normally, spring and early summer months are comparatively dry months on the north coast, but not this season. Copious rains have fallen this year, and aided by the warmer and earlier season of that part of the State, pastures should now be at their best.

They are, however, a sickly, yellowish green. In fact, it is difficult to find even a paddock displaying pastures of a healthier colour.

Behind those "yellow-green pastures" lies one of the main reasons for declining milk production. Colour in pasture is a fair indication of soil fertility, particularly in a normal, or better than normal, season. The present season is better than normal.

Our herds are mainly pasture fed. Over the years staggering quantities of the soil ingredients which go to make up soil fertility have been sold off dairy farms in the form of milk or cream, leaving the soil unable to support the better type of pasture. Thus, to-day, we have a comparatively useless grass like carpet grass (*Paspalum compressum*), to quote just one poor milk-producing species, bulking largely in north coast dairy pastures.

Over the years dairy production has been declining, not only on our north coast, but in all dairying areas.

So serious was this downward trend in the dairying industry that the Commonwealth Government, some two years ago, in collaboration with the States, launched a 5-year scheme (the Dairy Grant Scheme) to rehabilitate the industry.

It is generally admitted that our herds require a far better milk-producing ration than is being provided by those yellow-green pastures. Farmers up and down the coast, under the guidance of the Department's District Dairy Officers, Agronomists and other field officers, are demonstrating the wisdom, and payableness, of supplanting present worn-out pastures with more nutritious grass-and-clover mixtures. With proper prior preparation of the soil, addition of fertilisers and lime, sowing of suitable grass and clovers and correct pasture management, three things very vital to dairying

are being achieved. Soil fertility is being restored, production (and consequently returns) is being improved, and the asset values of farms and herds are being enhanced.

Some of the demonstration areas have already reached a stage where increased production and the condition of the herds are most convincing to other farmers attending field days on those farms.

If any dairy farmer has become so used to the yellow-green colour of his pastures as to disregard the warning signal they are sounding, then he should not miss the first opportunity of attending a field day on one of these pasture improvement demonstration areas. In many districts they are about the only farms on which can be found that dark green, vigorous pasture growth so common years ago on the rich north coast dairy lands.

Vacancies for University Trainees in Department of Agriculture.

VACANCIES for traineeships in Agricultural and Veterinary Science at Sydney University will be made available early in the New Year by the Department of Agriculture. Applications will be accepted after the Leaving Certificate Examination results are announced in January.

Applicants will be required to hold the Leaving Certificate or its equivalent and to be qualified for admission to Sydney University as matriculated students in the Faculties mentioned.

Early in February, 1950, applicants whose qualifications merit further consideration will be required to write an essay of not more than 2,000 words on the subject "Australia's Need for Population."

Full details as to conditions of employment in these traineeships will be given in advertisements which will appear in the *Positions Vacant* section of the press from time to time during the next few months.

Dusting with DDT for Control of the Lucerne Seed Caterpillar.

HEAVY or total losses of lucerne seed are often caused by infestations of the lucerne seed caterpillar (*Heliothis armigera*) in districts suitable for the production of this valuable crop. The caterpillar damages the flower buds, the flowers, the green pods, and will even attack the leaves of the lucerne plant. Often entire stands of lucerne are completely stripped of flowers.

This year a small dusting trial was carried out in the Coolah Valley, where all lucerne crops flowering in March were seriously damaged by this pest.

A 2 per cent. DDT-pyrophyllite dust was used in this trial, and it was applied at the rate of 30 lb. per acre from a Y2 power duster—a six-nozzle machine which treats a strip 18 feet wide. The machine was mounted on a utility truck, and was operated at a forward speed of 12 m.p.h., which would allow about 25 acres to be treated per hour.

Two ¼-acre plots of lucerne were dusted, the plants being generally in the early flowering stage, although some crowns were in full bloom, while others were still in bud. At the time of treatment the caterpillars were well grown and very numerous.

Three days after dusting, no caterpillars could be seen in the dusted areas, whilst high populations still remained in surrounding lucerne.

A fortnight later the two treated plots were flowering satisfactorily, and had set some seed, whereas hardly a flower could be found in 80 acres of undusted lucerne. There was no re-infestation of the treated plots and so another application of dust was unnecessary. As the value of the treatment was so obvious, no attempt was made to obtain seed yield figures.

It was apparent that the greatest amount of damage was done by the caterpillars while the lucerne flowers were still in bud, and in this case an earlier application of dust would have been desirable. It seems that the best time to treat a lucerne stand would be when just a few scattered blooms appear. Later treatments involve the risk of injury to pollinating insects.

The treatment used represents an outlay of about £1 5s. per acre for the dust, which is of little importance when compared with the potential value of the seed crop.

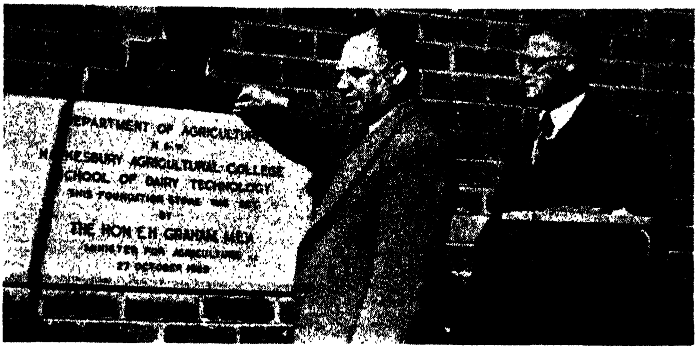
When this treatment of lucerne is considered, it must be remembered that crops treated with DDT should not be fed to stock.

The writer is grateful to Geigy Australasia (Pty.) Ltd., who supplied the dusts used, and to Messrs. Stephenson and Foster, of Coolah, whose willing co-operation made this trial possible.—
J. G. GELLATLEY, Assistant Entomologist.

NEW SCHOOL OF DAIRY TECHNOLOGY

At Hawkesbury Agricultural College

Foundation Stone Laid



Hon. E. H. Graham, M.L.A., Laying the Foundation Stone.
With the Minister is the College Principal, Mr. E. A. Southee.
[*Photo.: R. Eastoe.*

"IN erecting this new 'School of Dairy Technology' at Hawkesbury Agricultural College and equipping it with the most modern plant available at a total cost of about £125,000, the New South Wales Government has again given a lead in the efforts being made to expand the dairying industry in this State on the soundest possible lines. Its establishment is a big step forward in the training of the dairy technologists."

This statement was made by Hon. E. H. Graham, M.L.A., Minister for Agriculture, when laying the foundation stone of the new School of Dairy Technology at the College on 27th October in the presence of a large and representative gathering of people associated with the dairying industry.

Mr. E. A. Southee, Principal of the College, introduced the Minister and extended the welcome to the visitors, among whom were Mr. H. E. Handbury, of Victoria, a member of the Australian Dairy Produce Board; Mr. W. A. Howell, Chairman of the Milk Board; Mr. J. R. Graham, Federal President, and Mr. K. Humphry, State President of the Australian Institute of Factory Managers and Secretaries.

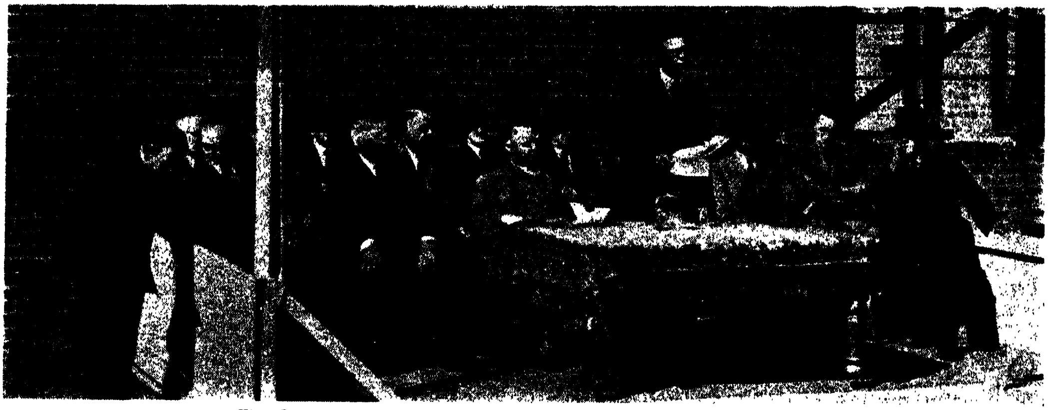
Mr. Southee said that since its inception in 1891 the College had been closely associated with experiment and research work upon dairy products as well as with the teaching of dairy produce manufacture.

A Diploma Course in Dairying (H.D.D.) had been instituted in 1912, and to date 315 Diplomas had been awarded. These graduates, he said, had spread far and wide throughout the length and breadth of Australia, about 40 per cent. of them occupying positions outside New South Wales. In recent years ex-students of the College had filled such positions as Commonwealth Supervisor of Dairy Exports and as Directors of Dairying in three States.

While the College was proud of these achievements in official positions, it was prouder still of the prominent part which ex-students had taken in dairying organisations. Ex-students present at the gathering, said Mr. Southee, were Mr. J. R. Graham, and Mr. K. Humphrys, Federal and State Presidents respectively of the Australian Institute of Dairy Factory Managers and Secretaries. Other "old boys" of the College had also occupied the positions of Federal President and State President of the Australian Society of Dairy Technology.

Foundation Stone Laid by Hon. E. H. Graham.

In his address prior to laying the foundation stone, the Minister for Agriculture, Hon. E. H. Graham, M.L.A., discussed the trends in the utilisation of milk produced in New South Wales. He said that 73 per



The Official Party on the Platform for the Foundation Stone Laying.
Mr. Southee addressing the gathering.
[Photo.: R. Eastoe.

cent. of the milk produced in 1940 was converted into butter, but in 1947 only 53 per cent. of milk was used for that purpose. In that period milk used as liquid milk increased from 20 to 35 per cent., while the quantity used for powdered milk, condensed milk and ice cream had doubled.

"Obviously these trends in the demand for milk indicate the need of facilities for the training of personnel in the manufacture of the different milk products," said Mr. Graham.

"By erecting this new School of Dairy Technology, the New South Wales Government is providing the facilities for the training of skilled personnel so that the dairying industry will be able to give the public the high quality products which it demands. Training will be given in butter making, ice cream making, liquid milk treatment, condensing, manufacture of different varieties of cheese, milk sugar production, lactic acid manufacture, etc."

Mr. Graham paid a special tribute to the Australian Society of Dairy Technology for its early sponsorship of the idea of establishing the School of Dairy Technology at the College, and the great assistance which the Society had given in the preparation of draft plans and specifications. He also thanked all representatives of the dairying industry and machinery firms for their co-operation.

Sucker Pigs Need Separate Food Supply.

As the milk production of sows reaches maximum about the end of the third week after farrowing and then decreases, suckers will be observed nibbling at their dam's food about this time, and they should then be given a food supply of their own with which the sow cannot interfere.

Creep-feeding is an excellent method of doing this. Part of the pen is fenced off, with the palings spaced to allow only the suckers to "creep" through to their own food supply.

It is most important that the creep ration be always fresh and wholesome to avoid digestive troubles arising from sour or fermented feed. A simple, dry ration is therefore recommended, such as crushed wheat, meat meal (15 per cent.), lime and salt (½ per cent. each). Five per cent. of dried separated milk or butter-milk, if available, is a valuable addition to the creep feed.

Iron Deficiency May Affect Suckers.

Milk of all animals, and of sows in particular, is extremely low in iron. If suckers are confined to wooden or concrete pens without access to soil, they are likely to suffer from iron deficiency. Under normal circumstances they supplement their iron intake by eating a certain amount of soil.

Where piglets are run without access to yards, they should have a shovelful of earth placed in the corner of the pen, and the iron content of this earth should be increased by pouring over it an ounce of crude iron sulphate (green vitriol) dissolved in water. Fresh earth should, of course, be supplied regularly.

The anaemia resulting from insufficient iron is evidenced by a poor growth rate, pale eye membranes, unthrifty appearance and increased susceptibility to infections such as scours and pneumonia.

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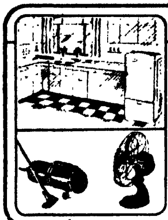

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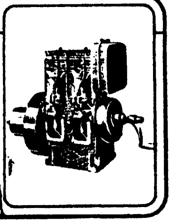

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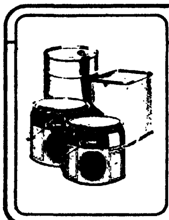

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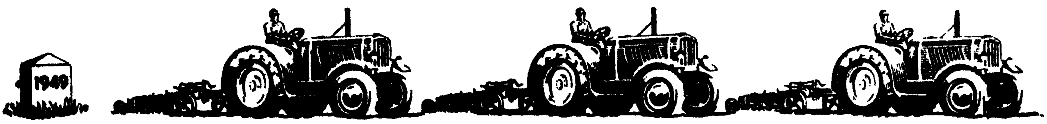

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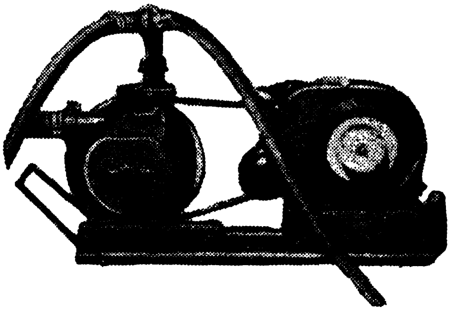

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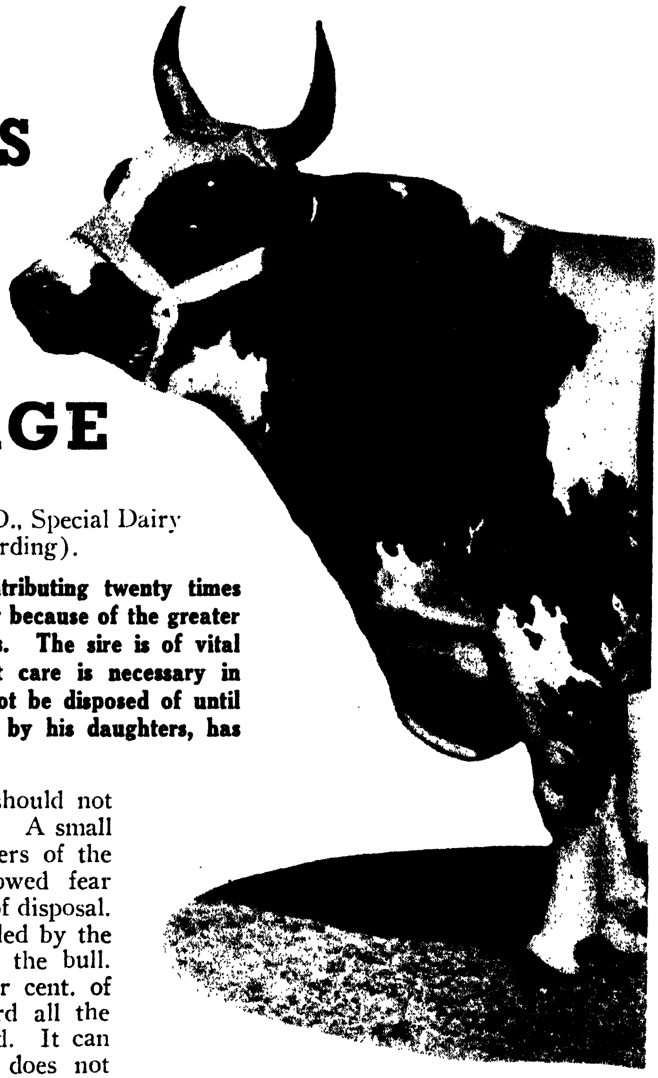
DAIRY SIRES AND SIRE WASTAGE



I. W. SCOTT, H.D.A., H.D.D., Special Dairy Officer (Herd Recording).

THE average sire is rated as contributing twenty times more to a herd than the average cow because of the greater number of daughters that he leaves. The sire is of vital importance in any herd and great care is necessary in making his selection. He should not be disposed of until his actual quality, as demonstrated by his daughters, has been determined.

If a sire proves a success he should not be discarded without good reason. A small survey carried out among members of the Herd Improvement Scheme showed fear of inbreedings as the major cause of disposal. In some cases this can be controlled by the erection of a paddock to confine the bull. The survey showed that 41.5 per cent. of the bulls were run with the herd all the time. This practice is condemned. It can be dangerous to human life, it does not allow proper control of breeding, shortens the life of the bull and no doubt accounts in part for the poor fertility in some herds. The small extra cost and trouble of having the sire under proper control is amply repaid.

In many cases the danger of inbreeding is exaggerated, the bull often being sold when his daughters are coming into production because "he has to be put to his own daughters." If the daughters show promise as producers and are robust in constitution little harm is likely by mating them to their sire. It is often advantageous to inbreed an exceptional bull by mating him to his granddaughters. However, there should still be good unrelated animals in the herd, and further replacements can be saved from these older matrons and the inbred calves discarded if so desired. In any case, the older proved cows should be the soundest animals from which to rear replacements. A sound breeding policy should not depend on the use of one sire, which is enforced where the sire is run with the herd. Proper bull paddocks enable more than one sire to be kept. They prevent the danger of indiscriminate inbreeding, enabling a sire to be kept until proven.

The following results have been obtained from a survey carried out in November/December, 1948, among co-operating members of the Department's Herd Production Improvement Scheme. The co-operation of 37 per cent. or 324 members in this initial survey is considered very satisfactory and many thanks are due to these men for their ready co-operation as well as to the Herd Recorders whose assistance made this survey possible.

The Department feels that trials of this type will provide information of value to the farmer and the industry in general.

Details of returns received are as follow:—

Dairying District.	Headquarters.	Returns.	Percentge of Herds Under Record.
No. 1	Lismore	83	37
No. 1A	Byron Bay ...	22	34
No. 2	Coff's Harbour ...	13	26
No. 3	Kempsey	44	71
No. 3A	Taree	16	20
No. 4	Maitland	24	17
No. 5	Moss Vale	22	45
No. 6	Bega	38	63
No. 7	Wagga	62	47
	Total	324	...

Analysis of Sires According to Breed.

Table 1 shows the bulls of each breed in use, pedigree registered, pure-bred unregistered, cross-bred and grade. Ninety-three per cent. of the sires in use in the herds from which the information came are pure-bred animals, and are presumably of superior breeding capacity. Of the sires in use 60 per cent. are Jersey, 21 per cent. A.I.S., 11.5 per cent. Guernseys, with the other breeds making up the balance.

Analysis of Pedigree Sires According to Age.

Table 2 summarises the position of the pure-bred sires in use on an age basis. While New Zealand results are scarcely comparable, it is interesting to note that 3 per cent. of the sires in the sample herds were 1 year to 2 years old, while in the New Zealand surveys 11.8 per cent. come within this class. This could be interpreted as indicating that in New Zealand it is the practice on many farms to use the sires at an earlier age with the idea of early proving.

Causes of Sire Wastage.

Table 3 sets out the reason for disposal of herd sires, New Zealand figures being shown as a matter of interest. It must be remembered that New Zealand figures are based on over 5,000 returns, while our figures are on only a few hundred.

Suitable Bull Yard and Shed.

It should be strongly constructed, with access to a paddock to allow ample exercise. The shed should have a feed trough and facilities for catching the sire.

TABLE 1.

	Jersey.	Guernsey.	A.I.S.	Ayrshire.	Friesian.	Red Poll.	Cross bred.	Total.
Pedigree Registered	170	31	63	14	6	4	2	290
Pure bred Unregistered ...	24	10	6	...	...	...	...	40
Total Pure bred Sires ...	194	41	69	14	6	4	2	330
Per cent. of all breeds ...	59	12	21	4	2	1	1	100
Grade Sires	18	...	5	...	1	1	...	25
Per cent. of all breeds ...	72	...	20	...	4	4	...	100
Total Sires	212	41	74	14	7	5	2	355
Per cent. of all breeds ...	60	11.5	21	4	2	1	0.5	100
Proportion of Pure bred to Grade Sires—								
Per cent. Pure bred ...	92	100	93	100	86	80	...	93
Per cent. Grade ...	8	...	7	...	14	20	100	7
Total	100	100	100	100	100	100	100	100

TABLE 2.—ANALYSIS OF "PEDIGREE SIRES" ACCORDING TO AGE, ENDING DECEMBER, 1948.

Age.	Jersey.		Guernsey.		A.I.S.		Ayrshire.		Friesian.		Red Poll.		Total.	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
1 year	3	1	3	4	...	...	...	...	3	37½	...	...	9	3
2 years	46	20	12	17	5	36	7	17	1	12½	...	...	71	20
3 years	38	17	12	17	2	14½	5	12	2	25	...	...	59	14
4 years	44	20	13	20	1	7	12	30	1	12½	...	...	71	20
5 years	31	14	8	11½	1	7	6	14	...	...	...	...	46	13
6 years	16	8	8	11½	3	21½	4	10	...	...	1	25	32	9
7 years	8	4	5	7	1	7	3	7	...	...	...	...	17	5
8 years	8	4	4	6	...	...	2	5	1	12½	1	25	16	5
9 years	14	6	2	3	1	7	...	...	...	...	...	...	17	5
Over 9 years ...	14	6	2	3	...	...	2	5	...	...	2	50	20	6
Total	222	100	69	100	14	100	41	100	8	100	4	100	358	100

TABLE 3.—SIRES AND SIRE DISPOSAL.

Cause of Disposal.	No.	Per cent. of Total.	New Zealand Figures Per cent. of Total.
Sold for dairying purposes	57	20.0	12.4
Danger of inbreeding	70	25.0	15.8
Sterility	8	2.8	9.3
Fence breaking and dangerous	13	4.5	9.3
Age	35	12.5	9.8
Accident and injury	18	6.3	7.9
Replaced by pedigree sire	37	13.0	Not stated.
Unsuitable sire	13	4.5	Not stated.
Progeny not up to standard	9	3.0	Not stated.
Other reasons—sundry deaths, etc.	24	8.4	35.5
	284	100.0	......

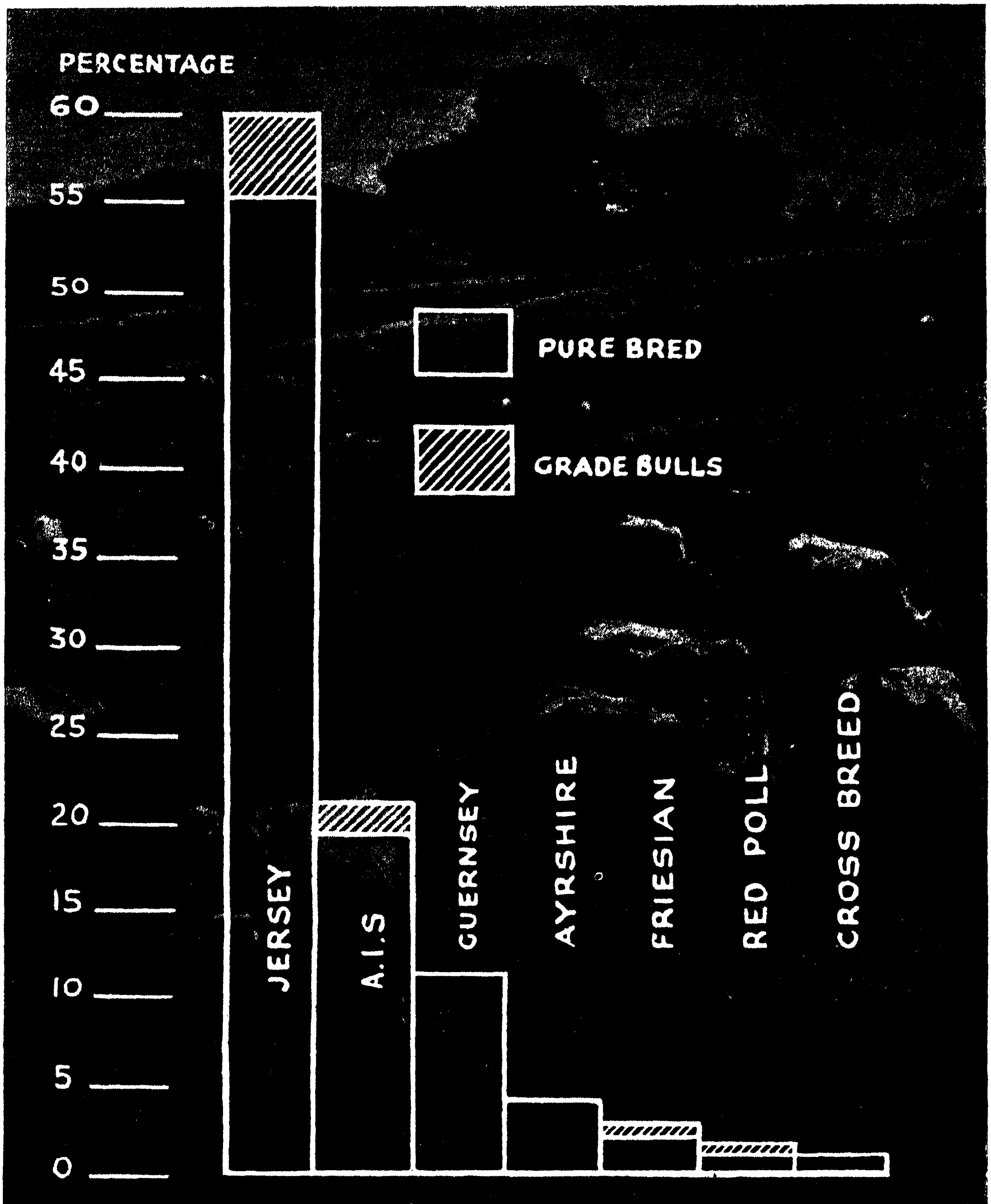
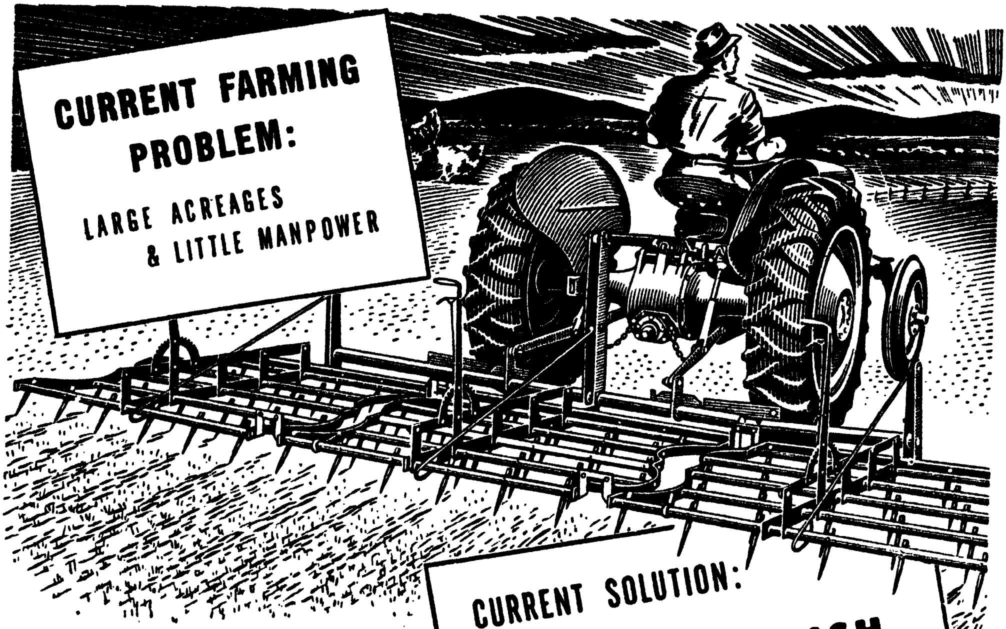


Figure 1

PERCENTAGES OF BULLS OF VARIOUS BREEDS IN USE



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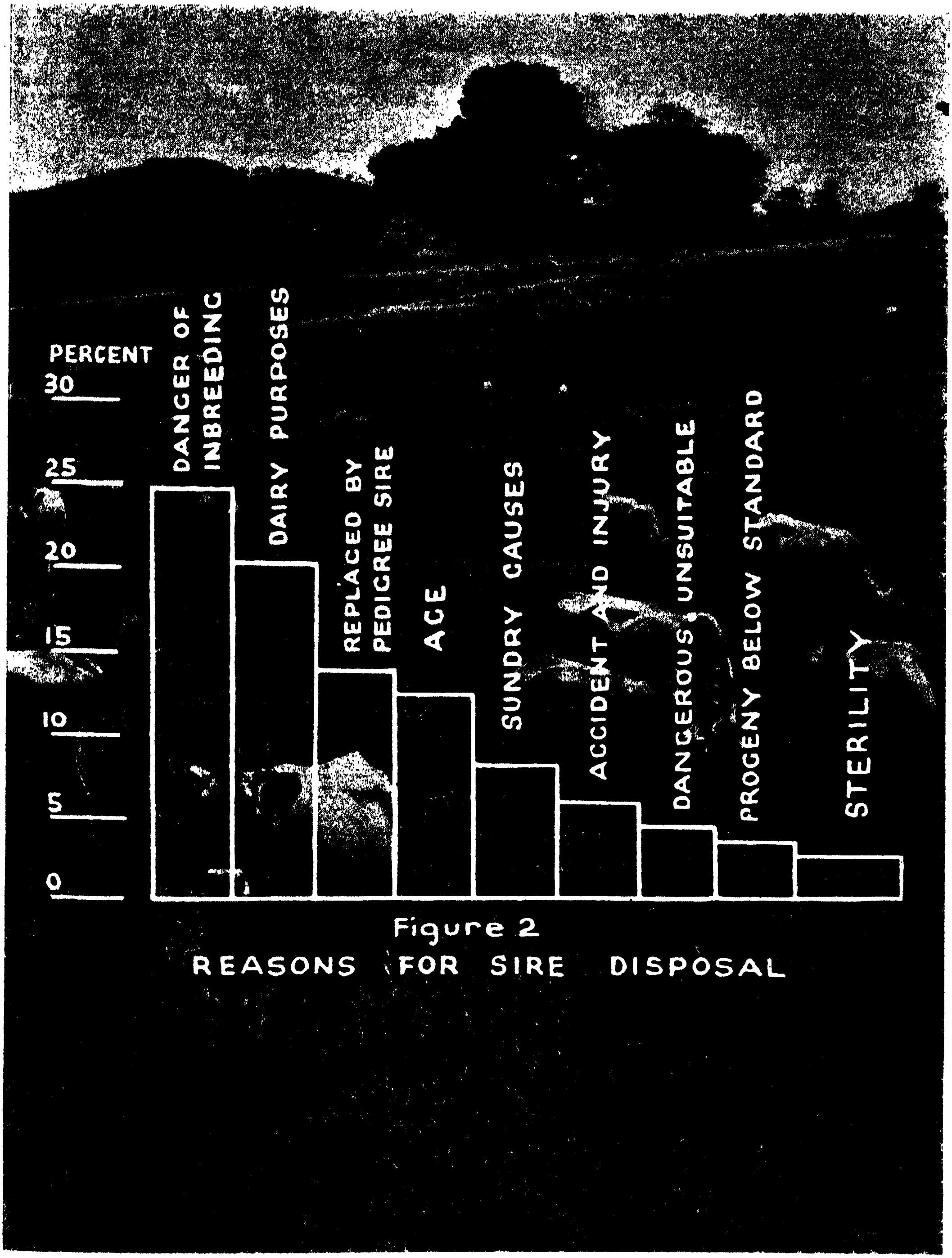


Figure 2
REASONS FOR SIRE DISPOSAL

Unfortunately, from the information collected there is some doubt that the figures cover bulls actually disposed of in the twelve months under review. In many cases it apparently refers to the disposal of the last bull used. The figures could, however, be taken as an indication of the distribution of disposals.

Danger of inbreeding, representing the major cause of disposal, merits serious consideration. It may be due to the fact that the sires are run with the herd—a bad practice—or that there are too many cattle of a particular strain on the farm. In view of the importance of retaining sires until proof of their work is obtained from their daughters' production, there does appear to be a need for an interchange of bulls by farmers to enable sires to be kept alive until proved.

TABLE 4.—AGE AT WHICH SIRES ARE DISCARDED.

	No.	Percentage of Replies.
Sire replaced every 2 years ...	17	9.2
,, ,, ,, 3 years ...	63	34.2
,, ,, ,, 4 years ...	57	30.9
,, ,, ,, 5 years ...	28	15.2
,, ,, ,, 6 years ...	13	7.0
,, ,, ,, 7 years ...	2	1.0
,, ,, ,, 8 years ...	4	2.1
	184	

Sires Run With Herd.

Of 272 replies, in 113 or 41.5 per cent. of cases the sire was run with the herd and in 155 or 57 per cent. of cases the bull was kept apart, while in four cases the bull was run with the herd part of the time; usually the sire being allowed with the herd for a period of one month only for mating. From one farm, situated in the Milk Zone, interesting data has been secured. Over the last few years this farmer has been working his herd so that all the herd calves within a period of one month. Previously he would turn the sire with the herd from the 1st to 31st May. This year with two bulls and a breeding plan, he commenced hand service on 1st May and by the end of June, all cows then being in calf, the following results were achieved:—

Sire No. 1—3 year old.

Mated to 29 cows—gave a Fertility Index or services per conception of 1.14.

Sire No. 2—8 year old.

Mated to 19 cows—gave a Fertility Index or services per conception of 1.05.

A Herd Index of 1.2 services per conception was obtained, with 83 per cent. of the cows holding to the first service. This is a high figure as it is considered satisfactory if 80 per cent. of the herd is in calf to three services or less.

New Zealand figures show a fertility rate for three year old sires of 1.43 and for 8 year old sires 1.47, with 68.5 per cent. of the cows holding to first service.

Long Straw Best for Thatching.

THE loss caused by depreciation of hay in unthatched stacks is very considerable, and every effort should be taken to see that hay conserved this season does not suffer spoilage from this cause.

The main essential in thatching is an ample supply of good, hard, clean straw of suitable length, showing a minimum of flag.

Varieties with a short, weak straw should be avoided. Straw showing forced or rank growth is not ideal, as it lacks strength and lasting ability and invariably carries an undue amount of flag.

Length is a very desirable feature, as the longer the straw the more weatherproof will be the thatch, while the work of building the thatch is much easier and less pegs are required to hold the straw securely in position.

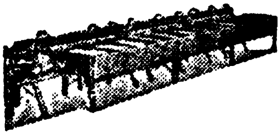
Straw should be cut at the earliest possible date after the harvesting machinery has gone over it.

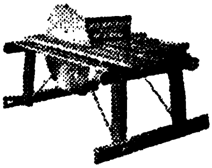
Summer Training of Young Deciduous Fruit Trees.

DURING spring and early summer, young deciduous fruit trees need periodical attention, and their growth should be directed by pinching back the growing points of leaders which are outstripping their neighbours. This keeps the growth even.

When the leading shoots of trees are extending very fast it is sometimes necessary to pinch them back to prevent them being blown out of shape or broken by heavy winds. Care should be taken when doing this that the shoots are not cut or pinched back below the tender growth, as if the more mature woody growth below is cut there is a possibility, with some kinds and varieties of fruit trees, of causing permanent stunting.

Even with vigorous older trees it may be advantageous to thin the growth to some extent to allow more light to penetrate through the tree. This work must be carried out carefully, and it is far better to underdo it than overdo it. If shoots are thinned out to too few, the remainder are far more liable to be destroyed by wind.





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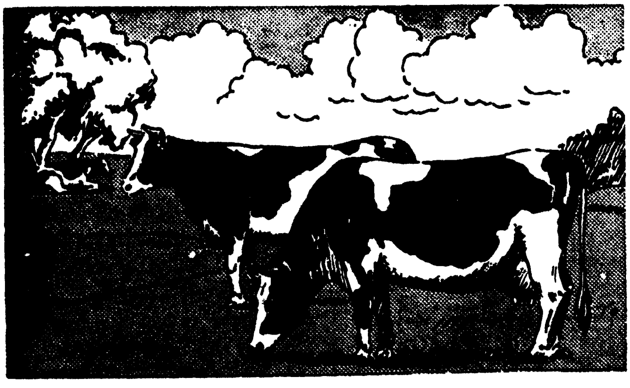

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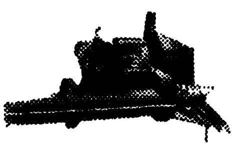

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THE FARM TRACTOR

Prevent Unnecessary Engine Wear

J. E. HUNT, A.M.I.A.M.E., Farm Mechanisation Section.

MODERN farm tractor engines in the hands of competent and careful operators have in many instances logged up to 4,000 hours of practically trouble-free operation. Other than general service such as lubrication, adjustment, attention to air cleaners and oil filters, the only minor job found necessary during this period has been the conditioning of the engine valves and removal of carbon. On the other hand, the same make and model tractor engine in the hands of incompetent and careless operators, after operating for a period of less than 1,000 hours, has been rendered practically unserviceable.

The excellent performance obtained from an engine by capable operators as compared with those operators who are careless and incompetent, bears out that "a machine is only as good as its operator."

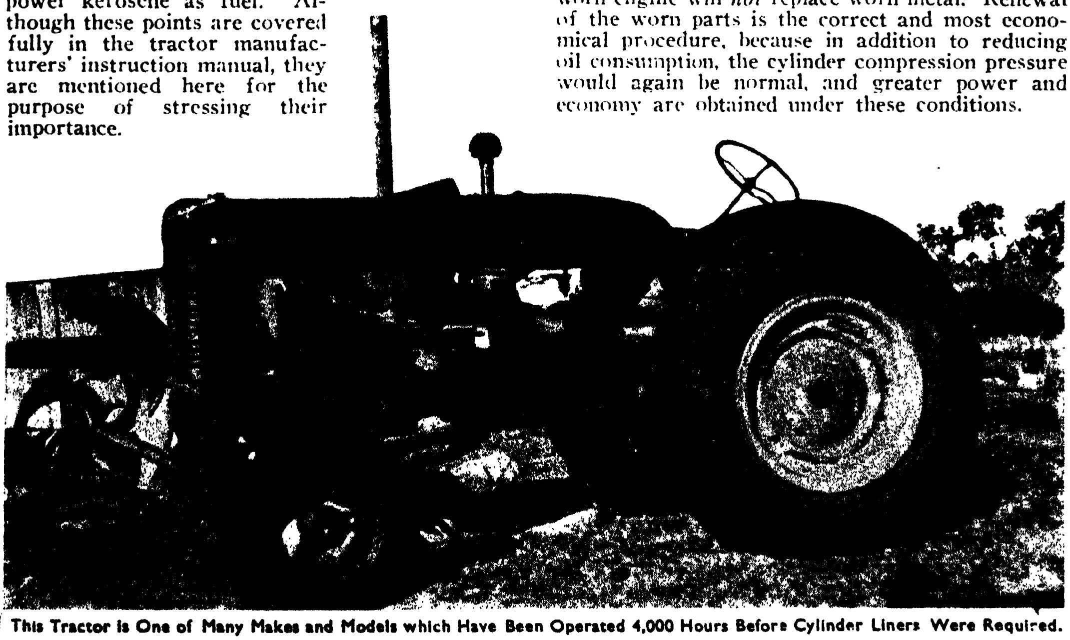
Tractor manufacturers and their distributors realise that careful service and adjustment of their tractors are necessary if best results are to be obtained. With this in view, manufacturers supply with every new tractor an operator's manual, which covers every aspect of service, operation and adjustment. The instruction in the manual is the most reliable information you are ever likely to get with regard to the care of your tractor, and you are advised to study it carefully and always keep the manual handy for reference.

The following points dealing with operation and service require particular attention, and if strictly carried out will help prolong the life of any internal combustion engine designed to use power kerosene as fuel. Although these points are covered fully in the tractor manufacturers' instruction manual, they are mentioned here for the purpose of stressing their importance.

Lubrication.

Only lubricating oil of the S.A.E. viscosity number specified by the manufacturers should be used in the engine. Heavier grades than those specified should not be used. The tractor manufacturers in recommending the grade usually quote the S.A.E. viscosity number of the oil. Mention is made of the lowest atmospheric temperature prevailing in the locality, and it is partly on this lowest atmospheric temperature likely to be experienced in the locality that the oil recommendation is based.

After the engine has operated for a period of several years and oil consumption has increased considerably, it is not advisable to use a heavier grade of oil to remedy this state of affairs. The correct procedure is to have the engine examined by a qualified mechanic and any necessary repairs effected. New piston rings may be required, or if cylinder liners, pistons and rings are badly worn they should be renewed. Use of heavy oil in a worn engine will *not* replace worn metal. Renewal of the worn parts is the correct and most economical procedure, because in addition to reducing oil consumption, the cylinder compression pressure would again be normal, and greater power and economy are obtained under these conditions.



This Tractor is One of Many Makes and Models which Have Been Operated 4,000 Hours Before Cylinder Liners Were Required.
This is equivalent to approximately 100,000 car miles.

The crankcase oil should not under any circumstances be used for longer periods than that specified by the tractor makers. Oil filters which are now fitted to almost every tractor engine assist in removing sludge, carbon, etc., which tends to accumulate in crankcase lubricating oil under operating conditions. However, oil filter blockage *can* occur, and to avoid this possibility (which could allow unfiltered oil to reach the engine bearings, etc.) new filter elements must be installed at the intervals specified by the manufacturers.

The oil storage system is important. Only clean drums with dust and waterproof caps should be used. Containers for transferring the oil from the drums to the engine crankcase should be free of grit or dust, as even a small quantity of grit mixed with the oil will cause considerable damage to the finely-finished engine bearings.

Any dust or dirt which may have collected around the crankcase filter neck or around the oil filter base should be thoroughly cleaned off before removal of the filter element housing, or of the crankcase filter cap.

When the crankcase oil is drained, and if the tractor is left standing in a cultivation paddock or adjacent thereto, do not leave the crankcase drain plug out overnight, as dust will enter at this point and will adhere to the oily surfaces of the crankcase, crankshaft, bearings, etc., and will mix with the fresh oil when it is replaced the following day. When the oil is hot it will usually drain off very quickly, and after a few minutes when the bulk of the oil has drained off, it is advisable to screw the plug in about one turn. This will allow any oil left in the crankcase to drip out overnight. In the morning remove the drain plug, when any accumulation of oil above the drain cock will run off.

Starting the Engine from Cold.

When starting up on petrol the engine should be warmed up as quickly as possible. Radiator shutters or a blind (whichever is fitted to the tractor) can be adjusted for the purpose of restricting air-flow through the radiator air passages, thereby allowing the water to reach a high temperature quickly. A thermostat, to prevent the water from circulating until a reasonable engine operating temperature is reached, is generally located between the cylinder head and the upper radiator water tank. If, at any time, difficulty is experienced in maintaining a reasonable engine-operating temperature, the thermostat should be removed and checked; the valve may be stuck open, allowing the water to circulate before reaching the temperature for which it was set to open.

If the engine has been started and has run for a few minutes, a good plan is then to start the tractor off with the load whilst still operating on petrol. By doing this the engine-cooling water, due to additional heat generated from the greater volume of gas burnt, will quickly reach the required operating temperature, namely, 180 to 200 degrees. At this temperature the petrol may be switched off and the kerosene fuel used. The temperature at which the engine should operate is specified in the operators' manual. Altitude has an effect on the operating temperature, and the degrees Fahr. at which water boils is also affected by higher altitude. Radiators fitted to some makes of tractor engines operate under pressure. The purpose of this is to increase the operating temperature of the engine without boiling the water. The filler neck seal must be in good condition if the system is to function efficiently.

Any change-over from petrol to kerosene before the engine-cooling water has reached at least 180 degrees Fahr. will bring about excessive wear to the engine. For every pound of fuel burnt in an internal combustion engine, approximately 1 pint of water results from the products of combustion. In an engine operating at a maximum permissible temperature this water passes out through the exhaust valves in the form of vapour, causing no damage to the engine. On the other hand, a cold engine will allow some of the water to contaminate the lubricating oil on the cylinder walls. In addition to this fault, an insufficiently-heated combustion chamber will not completely vapourise the heavy kerosene fuel, the lubricating oil will be diluted, heavy carbon deposits will form on the piston heads and in the combustion space, and the spark plug insulation will be fouled with soot. Further trouble is encountered due to incomplete burning of the partly vapourised fuel, the result of which is reduced engine power. Using kerosene fuel in an engine not properly heated-up is definitely uneconomical and is responsible for:—

- Reduced power output.
- Dilution of lubricating oil.
- Promotion of carbon deposits.
- Ruined spark plugs.
- Excessive engine wear.

Avoid Prolonged Idling.

Idling of tractor engines for long periods on kerosene should be avoided as much as possible. Occasionally when working the tractor in the field, the drawn implement or machine may require certain adjustments, which in some cases may require as long as fifteen to twenty minutes to complete. If the adjustments are likely to take more than five minutes to complete, the tractor engine should be stopped or run at a "fast idling" speed with the radiator blind partly closed to maintain the engine-cooling water at the specified operating temperature. Provision is made for adjusting the idling speed on most tractor engines, and the method of adjusting is fully explained in the tractor instruction book.

The Fuel Mixture.

The operator of a farm tractor should be competent in adjusting the carburettor fuel jets so that a perfect mixture is maintained at all times.

The instruction manual explains the procedure quite simply. If the engine operates on kerosene, the mixture must be adjusted when operating on kerosene and not on petrol. It is most important that the engine be run at least at half the maximum governed speed, and have reached operating temperature before any attempt is made to adjust the main carburettor jet. To weaken the mixture the main jet needle valve is turned in a clockwise direction; to enrich the mixture it is turned in an anti-clockwise direction. When adjusting the main jet, screw the needle valve in a clockwise direction, slowly, until the engine commences to run irregularly. Then screw the needle valve in a

counter-clockwise direction very slowly until the engine runs smoothly and without any indication of black smoke issuing from the exhaust. In adjusting the idling jet the engine should be run slowly. To weaken the mixture the needle valve is screwed in a clockwise direction.

The average carburettor will give very satisfactory service, provided only clean fuel is used in the tanks; and to ensure that no foreign matter enters the fuel system, which can obstruct the jets, it is best to strain all fuel into the tanks. By adopting this procedure annoying holdups will be avoided and frequent dismantling of the carburettor will be minimised. Should the carburettor at any time give serious trouble it would be best to have it examined and repaired by a mechanic competent to do this work. It will be found cheaper in the long run.

The Ignition System.

The complete combustion of the fuel and air mixture in the cylinders depends largely on a hot spark at the plug points. this is only possible when the magneto and its component parts are maintained in good condition. Magneto contact-breaker points and spark-plug gaps must be accurately spaced. The gap is specified in the tractor manual, and most tractor manufacturers supply gauges for both magneto and sparking-plug spacing.

High tension wires should be renewed on showing signs of deterioration, as considerable high tension current leakage can occur at this point.

Manufacturers of tractors specify a certain type of spark-plug for use in their engines. Suitability of the plugs for the engine is determined by heat range, size of hexagon, and other important features—and for this reason the specified plug should be used.

After the engine has operated for approximately 1,000 hours, it is recommended that the original plugs be replaced with new ones. The old plugs can be sandblasted, tested, and if found to be in fairly satisfactory condition, they can be used later as spares. The improvement in engine performance will more than pay for the installation of a new set of plugs after each 1,000 hours of operation.

The Air Cleaner.

Farm tractor engines are usually operated under extremely dusty conditions. For this reason the importance of maintaining the air cleaner in good order is strongly emphasised. Under very dusty conditions, quantities of up to half a pint of fine dust will be found in the filter at the end of a day's work. If this abrasive dust is allowed to enter the engine cylinders and mix with the lubricating oil, excessive wear will occur to the engine cylinders, valves, pistons and rings.

When tractors were first introduced into the wheat-growing areas, air-cleaners were not entirely efficient, and most of the wear that took place in the engines was due to dust and dirt entering the engine and mixing with the oil. Present-day air-cleaners are highly efficient if maintained in good condition. Service, such as changing the oil in the reservoir at specified intervals, using the right grade of oil, cleaning the wire mesh in the body of the cleaner, must be carried out if the cleaner is to function efficiently. Air leaks at the carburettor inlet joint and the air-cleaner outlet joint must be prevented at all times; should any air pass through these joints it would by-pass the oil bath of the air-cleaner and thus carry dust into the engine

Occasionally the entire cleaner should be removed from the tractor and thoroughly washed in kerosene. Dirt accumulates in the body of the air-cleaner and also in the tubes and wire mesh. In some cases this could restrict the free flow of air into the engine cylinders, thereby causing an over-rich mixture.

The manufacturers' instructional manual covers all details regarding the correct method of servicing air-cleaners, and most manufacturers recommend that the oil in the air-cleaner reservoir be changed daily, and when operating under extremely dusty conditions it should be changed *twice daily*.

Overloading the Engine.

A tractor engine must not, under any circumstances, be overloaded for long periods. Inexperienced operators generally have a tendency either to overload or underload an engine. If the speed of an engine were governed at 1,500 revolutions per minute, the tractor speed were 3½ miles per hour, and an overload were placed on the engine, the speed might be reduced to 1,200 revolutions per minute. The reduced speed of the engine would in turn reduce the speed of the tractor. By driving the tractor in the next lower gear the engine speed of 1,500 revolutions per minute would be maintained and the tractor could, under extreme conditions of overloading in the higher gear, travel almost as fast in the lower gear. It must be remembered that when the governed speed of the engine is reduced, the power available at the tractor drawbar is correspondingly reduced. Overloading an engine causes rapid wear and considerably reduces its economic life.

General.

The tractor instruction book is rightly termed "the most important part of the tool kit." Just reading it through once will not give the operator a good knowledge of the particular service and maintenance that it covers. Careful study of its contents from the first to the last page is strongly advised. It is always better to rely on the book than on one's memory, at least until such time as the whole correct procedure becomes habitual.

Before any engine adjustments, such as valve tappet clearance, are attempted, all dirt should be cleaned from the surfaces before removal of the covers. Gaskets should be replaced if broken, or in any way damaged; oil leakage from a valve cover will ultimately result in a general mess of oil and dirt over the engine.

Operators with a sound knowledge of tractor engine service and maintenance, and who give the engine regular and proper attention, can considerably reduce the current high demand for engine spare parts. The final results will be long engine-life, coupled with economy and trouble-free operation.

Refresher Courses in the Principles of Farm Management for Ex-Servicemen.

REFRESHER COURSES in the "Principles of Farm Management," which have been organised by the Department of Agriculture under the auspices of the Ministry of Post-war Reconstruction, will be continued at the Government Experiment Farm, Yanco, N.S.W., as under:—

No. 13 Course—8 weeks—9th January to 3rd March, 1950.

*No. 14 Course—5 weeks—13th March to 14th April, 1950.

*No. 15 Course—5 weeks—24th April to 26th May, 1950.

*No. 16 Course—5 weeks—5th June to 7th July, 1950.

*No. 17 Course—5 weeks—17th July to 18th August, 1950.

No. 18 Course—8 weeks—28th August to 20th October, 1950.

*No. 19 Course—5 weeks—30th October to 1st December, 1950.

Application to attend one of the above Courses should be made to the Deputy Co-ordinator, Rural Training, N.S.W. Department of Agriculture, Box 36, G.P.O., Sydney.

Applicants for a Refresher Course who are entitled to allowances during training must either (*a*) be in possession of a Qualification Certificate; or (*b*) a recommendation from the Classification Committee of the War Service Land Settlement Division, Lands Department, Box 39, G.P.O., Sydney; or (*c*) be eligible under the Re-establishment Division of Post-war Reconstruction. (These applicants must apply to the Deputy Director, Re-establishment Division, Post-war Reconstruction, Box 4318, G.P.O., Sydney.)

Applicants not coming within the above categories, but who are established on their own farms, or have reasonable expectations of becoming farmers, may, subject to the approval of the Deputy Co-ordinator of Rural Training, be admitted to a Refresher Course. These applicants will not be entitled to travelling or other allowances.

All Students attending Refresher Courses will be charged a Board and Lodging fee of 25s. per week.

The Courses Available.

These Courses are not designed to instruct beginners, but to provide the experienced farmer or grazier with knowledge regarding the latest developments, research and scientific methods, now proved and applied to modern farming.

*NOTE.—Number 14 Course is reserved for applicants wishing to specialise in Dairying and Pig Raising (Irrigation and Non-irrigation).

Number 15 Course is reserved for applicants wishing to specialise in Sheep and Fat Lamb Production (Irrigation and Non-irrigation).

Number 16 Course is reserved for applicants wishing to specialise in Sheep and Fat Lamb Production (Irrigation and Non-irrigation).

Number 17 Course is reserved for applicants wishing to specialise in Horticulture (Irrigation and Non-irrigation).

Number 19 Course is reserved for applicants wishing to specialise in Irrigation Farming.

Instruction is given in Elementary Agricultural Economics and Farm Management, and Lectures and Demonstrations on many Agricultural and Veterinary subjects and practices, and special instruction is also given in Wool Classing.

In the eight weeks' Refresher Course, the specialist is provided for by the division of the Course into specialist groups as under, each having its own syllabus and special instructor, and conducted in conjunction with General Irrigation Practices.

Group 1.—Sheep, Fat Lambs, Mixed Farming.
Group 2.—Dairy Farming and Pig Raising.
Group 3.—Horticulture.
Group 4.—Irrigation.

Applicants for the eight weeks' Refresher Course should indicate the specialist group they wish to join.

Visits are made, throughout all the Courses, to various Stud properties, Soil Conservation Research Stations, Experiment Farms and Colleges, and tuition is supplemented by films and other visual instructional aids.

Free rail tickets are provided to and from Yanco Experiment Farm for those students entitled to allowances.

Rates of Allowances per Week.

	£ s. d.	£ s. d.
(*a*) Single Student without dependants	....	3 15 0
(*b*) Single Student with wholly or part dependant	3 15 0	
Plus an amount not exceeding £1 11s., according to degree of dependency.		
Plus living away from home allowance	0 15 0	
		Range— 4 10 0 to 6 1 0
(*c*) Married Student with dependent wife	3 15 0	
Plus dependant's allowance for wife	1 11 0	
Plus living away from home allowance	0 15 0	
		6 1 0
(*d*) Married Student with dependent wife	3 15 0	
Plus dependant's allowance for wife	1 11 0	
Plus allowance for first child only	0 9 0	
And living away from home allowance	1 10 0	
		7 5 0

(*e*) Board and lodging at the Training Centre is charged at the rate of £1 5s. per week.

Further particulars may be obtained upon application to the Deputy Co-ordinator, Rural Training, N.S.W., Department of Agriculture, Box 36, G.P.O., Sydney.

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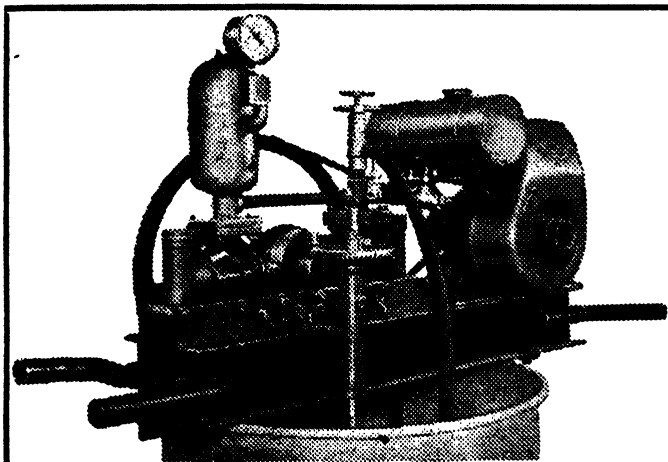

Extremely light and portable, it is easily handled on steep slopes. You can wheel it where you want it.

Labour and fatigue are minimised because a large area may be worked from each position in which the plant is placed. The ½ inch diameter hose with a pressure of 250 lb. per square inch is very easy to handle and coils without kinking. A 44-gallon wooden cask is mounted on sturdy light steel Hand Cart.

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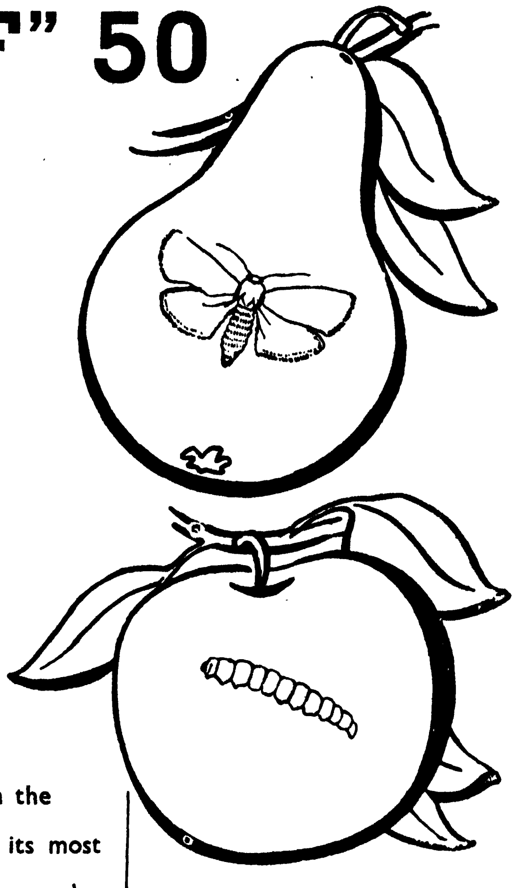
spells DEATH

TO CODLING MOTH AND WIDE RANGE OF FRUIT & VEGETABLE PESTS



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IMPERIAL CHEMICAL INDUSTRIES OF AUSTRALIA & NEW ZEALAND LIMITED

An Efficient and Economical FRUIT CASE CLEANER

T. N. POWELL,
Fruit Inspector,
Goulburn.

Fig. 1.—Case Cleaner in Operation.
Two cases being treated simultaneously, one on each buffer.

FRUITGROWERS quite frequently are able to purchase second-hand cases at reduced prices, but often the difficulty involved in removing the old labels, brands and marks is so great that any money saved in their purchase is eaten up in the cost of cleaning. Messrs. R. H. Charles & Sons, of "Normanton Park," Goulburn, have been able to surmount this difficulty by designing and installing a machine which is most efficient and reduces cost to a minimum.

The machine is shown in operation in Fig. 1, and the following illustrations show details of construction.

The set-up of the machine can be seen in Fig. 2, which shows the shaft and attachments rigged up on a small platform and being driven by a 1 h.p. motor with V-belt transmission from beneath the platform. In the centre is a small flywheel attached between the two bearings; this steadies the buffers when the machine is running. At each end of the shaft buffers are fixed. These are made out of softwood, and are 5 inches wide and 6 to 7 inches in diameter.

File cloth material 2 to 2½ inches wide is tacked around the rollers, two strips of file cloth (Fig. 3) being used around each buffer, giving a scraping surface of about 5 inches on each. The file cloth material,

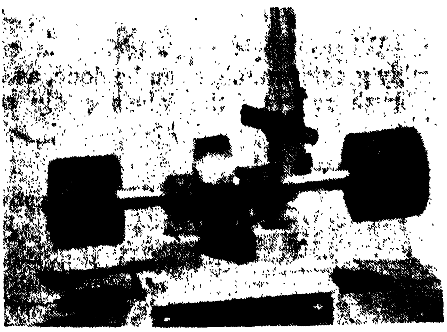

Fig. 2.—The Machine Ready for Use.

Fig. 3.—Detail of Method of Attaching File Cloth to Buffers.

which is secured by staples, is used for cleaning stencils, whilst wire brushes are used for removal of labels and cleaning the side

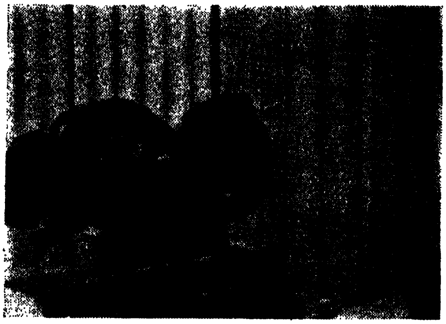

Fig. 4.—Buffer Removed and Wire Brush Attached.

of the case. When it is desired to change over from the file cloth buffer to the wire brush, the spindle is knocked out of the shaft, and the wire brush attached as in Fig. 4. File cloth material such as used by Mr. Charles is obtainable at 1s. 8d. per foot.

Fig. 5 shows a case deeply branded with black ink; Fig. 6 shows the same case with the brand removed. This took exactly 1¼

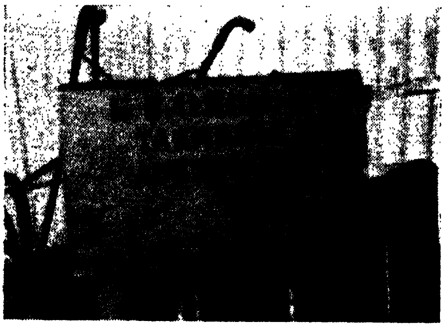

Fig. 5.—Case Deeply Branded in Black Ink Prior to Cleaning.

minutes, the file cloth buffer, of course, being used. To lengthen the life of the file cloth, the buffers are reversed from left to right and the "bite" thus increased until the cloth is worn out. In Fig. 7 the wire brush is in operation, removing a label and cleaning the end of the case.

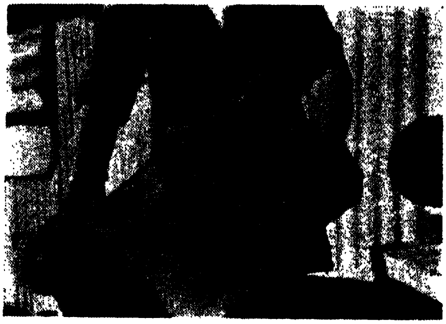

Fig. 6.—The Case shown in Fig. 5, After Treatment.

To minimise the dust problem and make working conditions more pleasant, Mr. Charles has found it an advantage to dip the case in water prior to placing on the buffer; ½ inch water in the bottom of any drum is quite sufficient.

Where the cases require cleaning on both sides and removal of brands on both ends, one man can clean about fifteen cases per

Fig. 7.—The Wire Brush in Use Removing Label from Case End.

hour. Where labels are attached, a considerably greater number can be done, as the wire brush removes the labels easily and quickly.

THE Minister for Agriculture, Hon. E. H. Graham, M.L.A. has received advice from his colleague, the Minister for Education, that the Bursary Endowment Board has granted registration under the Bursary Endowment Act to Wagga Agricultural College and has approved of bursaries awarded by the Board being made tenable there.

The Bursary Endowment Board's approval means that Wagga Agricultural College has now been placed on the same footing as Hawkesbury Agricultural College. Agricultural Scholarships granted by the Department of Education and awarded for competition each year amongst candidates who secure the Intermediate Certificate may also be made tenable at Wagga Agricultural College.

OLIVE TREE PROPAGATION

Review of Exploratory Trials Conducted at Wagga Agricultural College and Experiment Station

C. H. MORT, H.D.A., Fruit Officer.

THE olive has been grown in many countries for thousands of years and varying methods of propagation have been used. Various tests have been conducted into a number of aspects of olive tree propagation at Wagga Agricultural College and Experiment Station during the past few years.

From tests at Wagga it has been found that the olive is not a particularly difficult tree to propagate, and that many modern nursery methods can be used successfully. In the following article, the different methods tried are described for the benefit of intending propagators.

At present no information is available as to which method of propagation ultimately produces the most satisfactory tree for Australian conditions. Overseas, some authorities recommend trees produced by budding or grafting seedlings, while other authorities prefer trees raised from cuttings or other vegetative methods. At Wagga, although good nursery trees have been raised from all methods described here, the most consistent results have been obtained by growing and "working" seedlings.

Raising of Seedlings.

Variety of the Seed.—Pits from many varieties have been tried for raising seedlings and nearly all proved to be quite satisfactory. Verdale pits are considered slightly better than pits from any of the other better-known varieties; they give a good germination and produce vigorous seedlings of a good type.

In the tests, Sevillano, Palermo and Lucques gave poor germination, so it would be advisable to avoid these varieties until further tests are made.

In America pits from Redding's olives are recommended as particularly suitable for stock.[1]

Fifty-years-old Olive Trees at Wagga Agricultural College and Experiment Station.

Propagated on seedling stock.

Seed Cleaning.—The general method adopted at Wagga has been to rub the ripe fruit with half a brick against a 3/16 inch mesh screen to remove the skins and flesh, and then to wash clean with water. Up to 1 cwt. of fruit can be cleaned in this way by a man in half a day. This means ten thousand to thirty thousand pits according to the size of the olives treated.

Pre-treatment of the fruit by soaking for several hours in a 3 per cent. caustic soda solution to soften the skins and flesh and thus make rubbing easier, has been tried. This method is recommended in some American publications [1, 2] but it was found, here, that the time spent in washing to remove the caustic after this treatment more than offset any time gained in the rubbing out process. The process may be advantageous if large quantities were to be treated, but it is believed that under these conditions a mechanical "rubber" could be constructed at a reasonable cost.

Treatment with 2 per cent. hydrochloric acid to remove the flesh from the pits has also been tried, but no results of benefit were obtained.

In some seasons, the olive produces a number of pits in which the kernel fails to develop. These pits are lighter than those that contain a healthy kernel, and can be separated immediately after cleaning by flotation in a 25 per cent. brine solution. After this treatment, the good pits are immediately rinsed again in clean water.

Seed Sowing and Germination.

At Wagga, best results have been obtained by sowing the pits in June or early July, as soon as they are dried out after cleaning. The pits are sown thickly in rows, 6 to 8 inches apart, in seed-beds, firmed well into the soil, and covered with about 1 inch of loose mulch. These seed-beds are then kept continuously moist but not too wet.

A small percentage of the pits germinate the following spring, but the main germination occurs, either in the autumn about ten months after planting, or in the spring fifteen months after planting. Although this delayed germination has disadvantages, it has been found impossible to obtain more uniform germination by any of the methods tried.

Trials have been made to obtain a more even germination by cracking the pits before planting. Although a slightly better germination was obtained from these, the germination was still delayed, and it is considered that the increased germination does not warrant the labour involved. The pits have to be cracked very carefully to avoid injury to the kernel and the operation is a tedious one. It is considered preferable to plant an extra quantity of untreated pits to make allowance for the lower germination obtained.

Feeding of olives to turkeys for pre-sowing treatment of pits was also tried, but no seeds were recovered.

Some seeds require to be "after ripened" for effective germination. This is a natural process which may be artificially promoted by storing the seed in a moist medium at 35 to 40 deg. Fahr. for two or three months prior to planting. It is possible that more uniform germination of olive seeds would be obtained in this way.

Transplanting and Care of Seedlings.

At Wagga, the seedlings are generally transplanted from the seed-beds into nursery rows when they are 6 inches to 1 foot high. However, transplanting in early autumn has proved to be most satisfactory. Although seedlings transplanted at this time of the year require shading for a short period, the soil is warm and new roots form rapidly.

If glasshouse space is available, seedlings that come from the autumn germination are best potted when about 2 inches high, held in the glasshouse or other protected position through the colder months, and planted into the nursery row in the spring.

After planting, any side shoots arising from the lower portion of the seedlings are periodically removed to ensure 6 or 8 inches of clean butt for working.

(To be concluded.)

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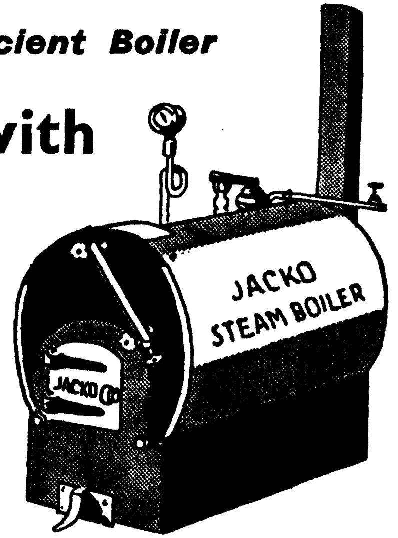

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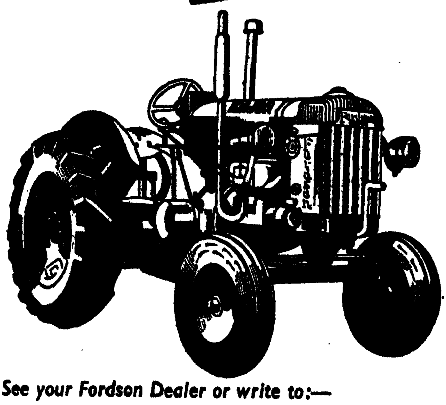

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1949 AND THE FUTURE

1949 will be remembered as the year in which the sterling, Australian and most other "soft" currencies were devalued—an event of outstanding economic importance and one which will have far-reaching effects on all sections of the community, effects which are only now beginning to be felt.

And yet looking back on 1949 it is apparent that, in so far as the Australian farmer was concerned, it was a year very similar to 1948. Overall the season was again good, crop yields were heavy and livestock production continued at high levels. Prices for nearly all primary products remained high—even prior to devaluation prices falls had been small, and some prices had risen. Following devaluation in September the price of our two main primary products, wool and wheat, rose substantially. The upward movement in costs, which had been apparent for several years past, continued and by the end of the year some of the effects of devaluation were being felt in further, and sometimes substantial, increases in costs. But at this stage the full effect of devaluation, even if realised, had not been felt by the farming community.

Farmers continued to experience many of the difficulties associated with the war and post-war years, although in some respects there were signs of improvement. Most building and fencing materials continued in extremely short supply—many farmers being unable to carry out desirable and necessary improvements or even to maintain existing improvements in a satisfactory condition for this reason. Farm labour was still scarce and expensive and some machinery was still hard to get, but here there were definite signs of improvement, tractor imports in recent months having been at record levels and local production of tractors having increased.

By and large, Australian farmers had another extremely prosperous year. Net farm incomes may have averaged very slightly lower than in 1948, but if so, that was the only year in which farm incomes exceeded 1949 levels. Despite slightly higher costs it is doubtful if there was any substantial difference between average net farm

income figures in 1948 and 1949. Once again wool and wheat producers enjoyed a particularly successful year from a financial point of view, while the dairying, fat lamb and beef-raising industries also experienced excellent results. On the other hand the poultry and some horticultural industries did not, by comparison, experience such highly satisfactory results, although even in these industries incomes were well above pre-war levels.

What of the Future?

Farmers may have every reason to expect their returns to remain high during the whole of 1950, although it is quite probable that prices for our two major export commodities, wool and wheat, will fall from their present levels. The recently announced increases in export contract prices assure meat-producers of reasonably stable prices during the coming year, while producers of dairy products and eggs can expect some further small increases in the prices of their products, although these may be more than offset by further increases in costs, partly the result of devaluation, which all rural producers can expect during 1950.

In the present unsettled state of the world economy further changes in the value of currencies are possible from time to time, and should there be any further re-adjustment of the Australian currency in relation to sterling or the U.S. dollar this will naturally have an effect on export returns and on costs in this country; the comments made in this article, however, are based on the assumption that all major currencies will remain stable at their present levels during 1950.

Under such circumstances it would appear that the upward spiral in costs will continue in Australia, while total gross farm incomes will probably fall slightly. Where a free market exists it would appear that prices for farm products have reached their peak —in some cases this peak was reached well over a year ago—but where products are sold under contract, as in the case of Australian meat, dairy products and eggs, and where the contract prices are subject to limited variations, depending, *inter alia*, upon production costs, there are still likely to be some price rises.

Wool—Satisfactory Prices Anticipated.

The 1948-49 wool selling season was characterised by all-time record prices, although there was a slight fall towards the end of the season. The current season, as was expected, opened at very satisfactory levels, prices being approximately equal to those ruling at the end of the previous season. However, following devaluation in mid-September there was an immediate and appreciable increase in prices, and while no attempt can be made to forecast the future market in detail, it appears likely that prices will remain at relatively high levels for the rest of the selling season.

Average Price of Greasy Wool at Auction (N.S.W.).

Season.	Pence per lb.
1938-39	10.3
1946-47	23.6
1947-48	37.9
1948-49	46.8
1949-50—September ..	41.2
October	51.3

World demand for wool continues to be very heavy and there is no reason to believe that the market will collapse during 1950, although it is probable that there will be some fall in prices during the year, while the average price for the 1950-51 season will more than likely be less than the average for the present season.

Wheat Prices Likely to Fall.

The International Wheat Agreement should provide Australia with satisfactory prices for the bulk of her wheat exports for the next three and a half years, but it does not seem likely that prices will for long remain at the new maximum price (following devaluation) of 16s. 1d. per bushel. The international wheat supply situation is improving—so much so, that the United States is faced with a serious surplus and has taken steps to reduce production in 1949-50; so that the gradual fall in prices which started in 1948 and continued until September, 1949, when it was suddenly, but probably temporarily, reversed by devaluation is likely to be resumed in 1950.

However, as with wool, and irrespective of the International Wheat Agreement, export wheat prices, although they will probably be lower in 1950 than at the moment, should still be extremely satisfactory to the Australian wheat-grower, while, with costs

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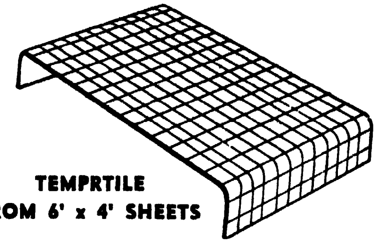

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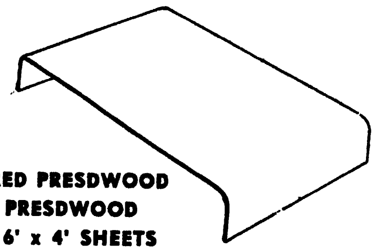

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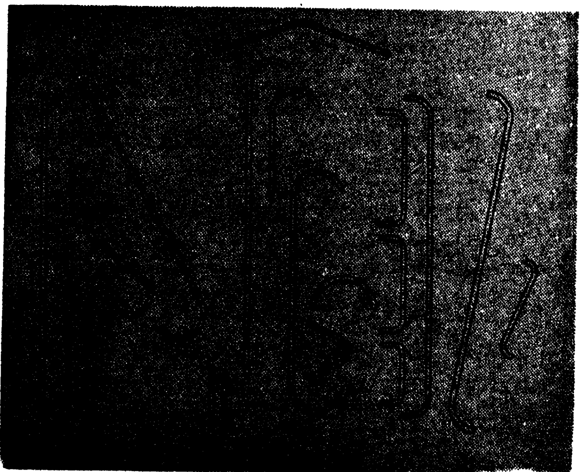

MA24B-49

in Australia still rising, a further small increase in the domestic price may be expected towards the end of 1950.

Returns to Wheatgrowers.
(Bagged per bushel—Sydney basis.)

	s.	d.
1938-39	2	9
1939-40	3	8
1940-41	4	0
1946-47	9	6
1947-48	13	2½
1948-49	8	0*

Increasing Home Demand.

Australian demand for rural products is increasing as the population expands. It has been estimated that by the end of 1957 the Australian population will have reached the 10 million mark, and to meet the demands of such a population it will be necessary to increase the output of several primary industries, while all export surpluses are likely to be reduced. Under these circumstances the future for the Australian producer of meat, butter, eggs and most other products is bright.

In the meantime Australia has forward contracts with the British Ministry of Food which provide assured markets for her surplus production of dairy produce, dried fruits, meat and eggs for 1950, and in most cases for considerably longer. The contract for dairy produce, which provides for limited price adjustments from year to year, operates until June, 1955. Prices under this contract rose in 1949 by 7½ per cent. and a further rise in 1950 may be expected. The dried fruits and egg contracts run until 1953, while the present meat contract expires next September, but a new fifteen-year contract has already been agreed upon in principle and prices for the first year have been fixed for some meats, so that meat producers have assured markets for a considerable time to come.

Devaluation has also opened up a new overseas market for Australian oats, and other coarse grains, but the extent and relative permanence of this market is hard to judge. Export prices for barley have increased substantially as a result of devaluation. On the other hand there are signs that the export market for some canned goods, such as tomato products, is contracting.

* Advance to date: it is likely that the total return for this season will be slightly below that of 1947-48.

The position may be summarised by saying that while total gross returns for rural products will probably be lower in 1950 than in 1949 (although for some products gross returns will be higher), total costs will be higher. Nevertheless net incomes in nearly every branch of farming will remain very satisfactory and far in excess of pre-war levels. At the same time farmers will also continue to be beset with many of the worries and shortages which have, to date, characterised the post-war period.

Labour, Materials and Machinery in 1950.

Labour on New South Wales farms reached its lowest level for several decades in 1944. Between that year and 1948 there was a gradual return of labour to the farms, although in 1948 the total number of persons permanently employed was still significantly less than at the outbreak of World War II.

It now appears that the position has been stabilised at about the 1948 level, and it is unlikely that there will be any further extensive return of workers to the farms unless Australia experiences a definite recession in its general economy. While an economic recession may occur in some few years time, it does not appear likely that even a mild recession will be experienced in 1950, so that farmers may expect labour to remain scarce and expensive during the coming year; in fact, labour costs are likely to be slightly higher than in 1949, and labour just as hard to obtain.

Nor are there any immediate prospects of any substantial improvement in the supply of materials, although the position may be expected to ease slightly during the course of the year.

For machinery the outlook is generally brighter. Headers, pick-up hay balers and some other harvesting machinery are still in extremely short supply, and the position is likely to improve only slowly. However, the position in so far as most other tractor-drawn implements is concerned is more satisfactory, and although there is frequently some delay in delivery, sometimes of several months duration, with a little foresight farmers can usually obtain the machine they require. The tractor position, in particular, has improved considerably, and there is now no real shortage of either small

or medium-sized tractors, although some particular American makes are almost unprocurable.

As the result of the "dollar shortage" there has been an important change in the source of our tractor supplies. Until recently the United States was the main supplier of tractors to Australia, but the swing towards British tractors which began in 1948 has continued, and during 1949 the majority of tractors sold in Australia were of British manufacture. A number of European models were also placed on the market for the first time during the year, but to date only limited numbers have been supplied. It is expected, however, that the supply of European tractors will show a considerable increase in 1950. The year 1949 also saw one of the largest of the American manufacturers commence the distribution of their Australian-produced tractors, tooling-up for the manufacture of which has been in progress for some time. Several other firms are also producing tractors in Australia and local production should expand considerably in 1950.

It seems probable therefore that only the larger types of tractor will be in short supply in the coming year, and here the supply position should be considerably better than in any post-war year. Individual makes, however, formerly popular, may be unprocurable, while the few fully imported American tractors available will be very much more expensive than in the past.

The general upward movement in farm machinery prices which has been in evidence since the war is almost certain to continue, and both British and Australian machinery are likely to show some price increases, while, as already mentioned, American machinery will show such substantial increases in price as probably to place it out of the reach of many farmers who, in the past, have used American equipment.—P. C. DRUCE, Acting Senior Economics Research Officer.

MECHANISATION IN THE DAIRYING INDUSTRY

MECHANISATION of the dairy industry in New South Wales has expanded at an increasingly fast pace during the last decade, although it has been proceeding gradually during the whole of this century. The rate of increase in the use of machinery during the past fifty years has, however, been far from uniform.

The introduction of milking machines at the turn of the century resulted in the first significant use of machinery in the dairy industry. Prior to 1900 the quantity and value of machinery on dairy farms was almost negligible, but by 1920 dairy machinery on farms was valued at almost £1 million, the value having doubled between 1900 and 1910, while between 1910 and 1920 it almost doubled again. However, during the 'twenties the use of machinery did not continue to expand at such a rapid rate as in the early part of the century, and with the onset of the depression of the early 'thirties there was a distinct falling off in new machinery purchases by dairy farmers. In some years of the early and mid-'thirties the total value of machinery on dairy farms showed a fall, largely due, no doubt, to the fact that normal replacements were not being made owing to the depressed state of the industry. But with the outbreak of World War II another period of rapid mechanised expansion began, and still continues.

The two periods of rapidly increasing mechanisation differ in at least one important respect. In the early part of the century the increased use of machinery was due primarily to the introduction of the milking machine. The present period of expansion is due in part to a further significant increase in the use of milking machines, and again this is the main factor, and in part to a significant, and economically important, increase in the use of tractors and tractor-drawn equipment by dairy farmers. Prior to World War II the ownership of a tractor by the dairy farmer was rare; to-day it has become relatively common.

Table I shows the value of machinery in use on dairy farms at the end of each decade from 1900-01 to 1930-31 and for the years 1938-39 to 1940-41. The figures are as recorded by the Bureau of Statistics and Economics.

TABLE I.—VALUE OF FARM MACHINERY AND IMPLEMENTS ON DAIRY FARMS.

	£
1900-01	237,200
1910-11	534,740
1920-21	910,260
1930-31	1,171,000
1938-39	1,275,622
1939-40	1,408,270
1940-41	1,502,849

After 1940-41 the presentation of the statistics was altered, values no longer being shown. The rapid rise in costs which has been a feature of the past decade would, in any case, seriously reduce the usefulness of figures showing values of machinery in recent years and, in so far as both milking machines and tractors are concerned, numbers on farms give a far better indication of the increase in their use.

Milking Machines.

Table II shows the number of milking machines in use at 31st March, 1939, to the same date in 1949. The figures quoted are numbers of stands. Most farms have from two to four stands.

TABLE II.—NUMBER OF MILKING MACHINES IN USE (NUMBER OF STANDS).

At 31st March.	
1939	8,119
1940	10,815
1941	12,881
1942	15,586
1943	18,365
1944	22,108
1945	25,177
1946	27,157
1947	28,861
1948	29,921
1949	31,305

The average number of stands per farm is estimated at three; granting this assumption then about 10,440 dairy farmers in New South Wales use milking machines. There are, on the other hand, less than 16,700 dairy farmers in the State with herds of fifteen or more cows, consequently it would appear that about three out of every five farms in the State on which dairying is a major enterprise are now equipped with milking machines. In 1939 it is doubtful if more than three dairy farms in twenty were so equipped.

The installation of new milking machines reached a peak in 1943-44, but has fallen fairly steadily since, although there were substantially more new machines installed in 1948-49 than in 1947-48. The rate of installation is still considerably above the pre-war rate, but although there remain probably 6,000 dairy farms in the State which are not equipped with milking machines, it would appear probable that in the future new installations will show a further falling off from the 1948-49 level, in which year, incidentally, less than half the number of new machines were installed compared with the peak year of 1943-44.

Increase in Tractor Numbers.

Unfortunately the number of tractors in use on dairy farms is not available, but the number of tractors in use in coastal districts has been tabulated since 1939. Figures were also collected in 1930 and are shown in Table III. While all the tractors in this classification would not be used on dairy farms the great majority would be, and it is probable that the figures give a reasonable indication of the relative increase in tractor purchases by coastal dairy farmers which has taken place in recent years and which is continuing at the present time.

TABLE III.—TRACTORS IN USE IN COASTAL DISTRICTS.

At 30th June.	
1930	447
At 31st March.	
1939	1,442
1940	1,807
1941	1,911
1942	1,648
1943	2,114
1944	1,654
1945	2,398
1946	2,584
1947	3,024
1948	3,336
1949	4,003

It is estimated that at least 75 per cent. of the tractors in use on coastal farms are operated on dairy farms. There are approximately 14,500 coastal dairy farms with fifteen or more cows, so that it would appear that, at 31st March, 1949, just over one coastal dairy farmer in five owned a tractor. In 1939 the equivalent figure was probably about one in fifteen.

What has caused this great increase in the use of tractor power by dairy farmers, most of whom crop comparatively small areas? There appear to be several inter-related factors:—

(i) First, and perhaps of most importance, is the fact that during recent years the dairy farmer's financial position, in common with that of other rural producers, has improved considerably. He has had more money available to invest in capital equipment.

(ii) Smaller tractors suitable for use on dairy farms, although not necessarily an economic acquisition, have been developed only in recent years.

(iii) Labour shortages and high wages have caused some farmers to adopt labour-saving devices which they might not have been interested in, or prepared to adopt, if circumstances had remained as they were prior to World War II, when labour was cheap and easy to obtain.

(iv) The New South Wales Farm Mechanisation Scheme, inaugurated in 1943, undoubtedly increased the dairy farmer's interest in the use of tractor power on small farms.

Economic Significance.

This rapid expansion in the use of the tractor on dairy farms is of some economic significance. The purchase of a tractor involves a considerable capital outlay, the cheapest, and at the same time probably the most suitable, tractor available for the purpose costing slightly less than £600. Implements, in addition to those already owned by the farmer, are also likely to be required, resulting in a probable total capital outlay of from £700 to £900.

When it is considered that the area cropped by coastal dairy farmers rarely exceeds 40 acres per annum and is usually less than 30 acres it is obvious that there is a serious danger of over-capitalisation. Undoubtedly some dairy farmers crop a sufficient area or have other uses for their tractors, such as pumping water, to justify, on economic grounds, the purchase of a tractor and tractor-drawn equipment; undoubtedly many others will find that, even after taking the present relatively high labour costs into consideration, the purchase of a tractor is not a sound business proposition.

Where the purchase of a tractor is decided upon it is important that the tractor chosen should be the most suitable type and size available for the purpose. In the past some dairy farmers have purchased tractors which are more suited to wheatgrowing than dairying, thereby outlaying an unnecessarily large amount of capital and wasting power-output.—P. C. DRUCE, Acting Senior Economics Research Officer.

Winter Wheat Breeding Programme at Glen Innes and Yanco.

WITH the object of breeding early maturing wheats of winter habit, the Department has established winter wheat breeding programmes at New England Experiment Farm, Glen Innes, and at Yanco Experiment Farm.

Such a wheat, if developed, could be sown early in autumn with little or no danger of premature heading during winter, but would mature at the normal time.

A wheat of this type would have the advantage of a much wider range of sowing dates, and would greatly minimise the danger of stem frost injury.

The only Australian variety recorded as possessing winter habit characteristics is a selection made from a strain of Minflor, known as Winter Minflor. This selection has been under test in several wheatgrowing areas in comparison with standard varieties, and some interesting observations have been made indicating its winter habit. It must be stressed, however, that Winter Minflor is not regarded as a satisfactory commercial variety. Winter Minflor, together with other wheats of winter habit, is merely being used as a parent in the breeding programme.

Some time must elapse before a winter wheat possessing high yield, good grain quality disease resistance and other desirable field characters is available for sowing on a commercial scale.

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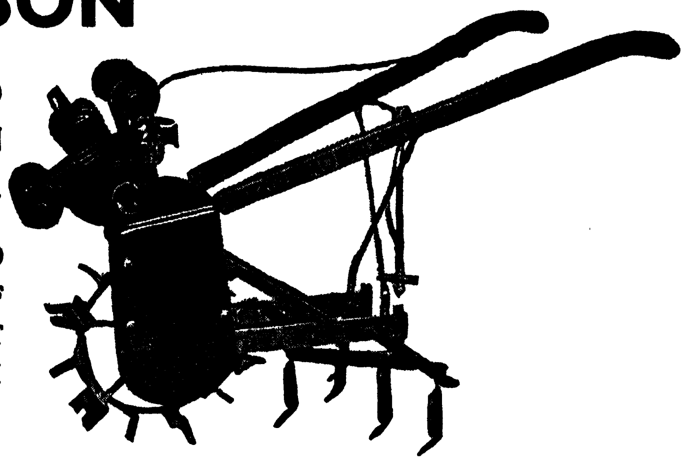

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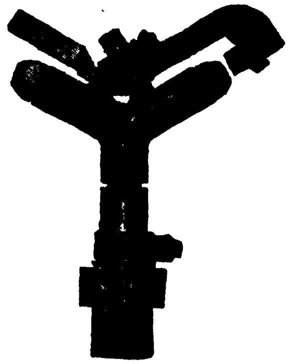

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STUNTING AND SCALY BUTT OF CITRUS

Associated with Poncirus trifoliata Rootstock

(*Continued from page* 582.)

R. J. BENTON, Principal Fruit Officer (Extension); F. T. BOWMAN, Ph.D., Special Fruit Research Officer; LILIAN FRASER, D.Sc., Plant Pathologist; R. G. KEBBY, Special Fruit Officer.*

THE purpose of this article is to record the discovery of the cause of the chief factor which has limited the use of *Poncirus trifoliata* as a rootstock for citrus.

The first instalment, in October issue, dealt with the merits and de-merits of the stock, and the second (in November) with the variations in the stock and with the symptoms of the scaly butt disease. The current instalment deals with experimental and field evidence of a virus cause of scaly butt.

(i) CAUSE OF SCALY BUTT.

Evidence has accumulated—which is set out in the following section—that the most probable explanation of scaly butt is that it is brought about by the presence of a virus in the scion to which the stock reacts by bark scaling—a virus which is symptomless except in combinations with trifoliata.

Experimental Evidence.

(*a*) *Inarching.*—Four-year-old trees of Washington Navel orange in a block of ninety-three particularly unsatisfactory trees on trifoliata stock at Dooralong were inarched in October, 1943 and 1944 with two trifoliata seedlings per tree. Seedlings (and as such presumed free of virus) were derived from a number of different parent trees. The inarches took well and have grown, although they have not brought about any improvement in the trees. Scaling on inarches is shown in Fig. 10. Scaling started to show in a few of the inarches when they were about four years old, and their condition in January and July, 1948, is shown in Table I.

(*b*) *Budwood.*—In 1941 trifoliata seedlings derived from two stock trees at Narara Viticultural Nursery were worked with buds taken from two thirty-eight-year old Washington Navel orange trees on trifoliata stock, one of which was severely affected with scaly butt and markedly stunted and the other a non-scaling, well-grown tree. Only a small amount of budwood was obtainable from the dwarfed tree. The budded trees were planted out in spring, 1942, at Leeton and Narromine, N.S.W. The condition of the trees at Leeton in July, 1949, is set out in Table II.

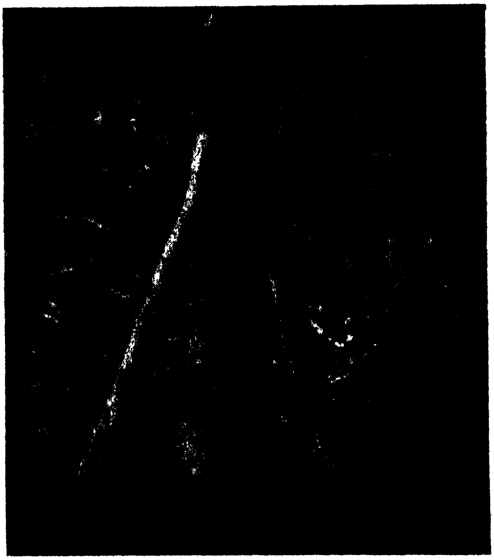

Fig. 10.—Scaling Appearing on Trifoliata Inarches of a Scaly-butted Washington Navel Orange.

* The three first-named authors were constituted as a Committee in 1943 to investigate the problem reported herein. Mr. Kebby joined the Committee in 1948 on his appointment to the position of Special Fruit Officer (Citrus) formerly occupied by Mr. Benton.

The authors wish to acknowledge the valuable field assistance of Mr. A. C. Arnott, Fruit Inspector, and Mr. E. C. Levitt, Fruit Officer, as well as officers of Narara Nursery who carried out the propagational work. The keen co-operation of Mr. W. Barrett, of Dooralong, Mr. H. J. Braund, Griffith, and many growers and nurserymen, is also gratefully acknowledged.

TABLE I.—DOORALONG PLANTING.

Condition of Trees, January, 1948.	Number of Trees Inarched.	Number of Trees with Inarches Affected.		Condition of Inarches.	
		Jan., 1948.	July, 1949.	January, 1948.	July, 1948.
Scaly butt, severe ...	29	6	8	(*a*) Both inarches affected	(*a*) As before.
				(*b*) One inarch affected, one failed to take.	(*b*) As before.
				(*c*) One inarch affected, one free of scaling.	(*c*) Both inarches affected.
				(*d*) One inarch slightly affected, one free of scaling.	(*d*) Both inarches affected.
				(*e*) One inarch showing symptoms of incipient scaling, one free of scaling.	(*e*) Both inarches affected.
				(*f*) One inarch, showing symptoms of incipient scaling, one free of scaling.	(*f*) As before.
					(*g*) Both inarches affected.
					(*h*) Both inarches affected.
Scaly butt, slight ...	4	0	0	Healthy	Healthy.
Non-scaly butt ...	3	0	0	Healthy	Healthy.
Non-scaly butt, dwarfed	13	0	0	Healthy.	Healthy.

TABLE II.—LEETON PLANTING.

Source of Budwood.	Total Number of Trees.	Degree of Scaling.			Percentage Affected.
		Severe.	Suspect.	None.	
Trees affected with scaly butt	6	5	1	0	100
Trees free of scaly butt ...	49	...	...	49	0

An additional thirty-two trees propagated from non-scaly butt sources were included in the original Leeton plantings, but following some casualties from frost, the block was compacted by moving some trees and replacing others so the total number surviving could not be counted. No scaly butt was present in this block.

The condition of the trees in September, 1949, at Narromine, is shown in Table III.

TABLE III.—NARROMINE PLANTING.

Source of Budwood.	Total Number of Trees.	Degree of Scaling.			Healthy	Percentage Affected
		Severe	Slight.	Suspect.		
Trees affected with scaly butt	15	6	1	0	8	47
Trees free of scaly butt ...	78	4	2	1	71	9

The trees had been rather neglected and were subject to frost injury, and were therefore small for their age. Most of the trees which have developed scaly butt were grouped towards one end of the experimental block, which is long and narrow. The trees propagated from the unaffected source are the more vigorous, notwithstanding the general lack of care.

The figures from the Narromine planting are at variance with those from the Leeton planting, in that only 50 per cent. of trees propagated from affected sources are scaling and 8 per cent. of trees from unaffected sources are scaling. A possible explanation of this is given in the discussion.

(*c*) *Reciprocal Working.*

(i) TOPWORKING.—Two sister trees of Thompson Navel orange on rough lemon stock growing at the Narara Viticultural Nursery were topworked in 1943, when six years old, with a number of buds of trifoliata. These buds had been specially chosen from stocks and trees for freedom from scaly butt; some were from suckers from stocks of good trees, the remainder were from seedling trees. Several of the trifoliata propagations died. The survivors grew reasonably well, and in September,

1948, several on one tree had developed a scaling condition (Figs 11, 12). No scaling has developed on the duplicate tree. The results are shown in Table IV.

TABLE IV.—TOPWORKING.

Source of Wood used for Topworking.	Condition of Topworks, December, 1948.	
	Tree A.	Tree B.
Trifoliata selection—		
8—Sucker from non-scaling stock under Washington Navel...	No scaling	......
9— " " " ...	......	Scaling.
11— " " " ...	No scaling	......
50— " " " ...	No scaling	Scaling.
51— " " " ...	No scaling	......
48—Sucker from non-scaling s.b. stock under Unshiu Mandarin	No scaling	......
49—Seedling tree (unworked) ...	......	......
22— " " " ...	......	......
23— " " " ...	No scaling	Scaling.

The only possible interpretation of these results appears to be that the Thompson Navel orange was affected with scaly butt virus and that the virus has been transferred to the topworked clones. The reasons for one tree producing and the other not producing scaly butt are advanced in the discussion.

(ii) NURSERY TREES.—One-year-old Washington Navel orange trees of two bud sources on seedling rough lemon stocks were budded with trifoliata clones in August, 1947. As already pointed out, experiments commenced at that time were designed to find whether there were sources of trifoliata which would give a high percentage of compatible trees when budded with Washington Navel orange. Since scaly butt is slow to show up on worked trees, some experiments were made which aimed at finding short-cut methods for the detection of good types of trifoliata. The experiment just described was one of these. Washington Navel orange on trifoliata stock shows scaly butt in four to eight years from budding, but it was hoped that trifoliata on Washington Navel might show differences in vigour, or some other symptom in a shorter time. Since the possibility of a virus in the scion was not at that time being investigated the budwood was taken from two trees on rough lemon stock. The results are shown in Table V.

Compared with the vigorous growth of trifoliata budded on to rough lemon seedlings the growth of the very small and medium scions was much stunted, the internodes short, the leaves small and yellowish-green and the twigs slender (Fig. 13).

If stunting were due to incompatibility of the scion to certain stock strains, the growth of trifoliata selections Nos. 48 and 8 at least should have been even and good, since these came originally from suckers from non-scaling trees.

Field Evidence.

(*a*) *Origin of Budwood.*—In most blocks of Washington Navel on trifoliata where the origin of the stocks is known, these are from mixed sources, *i.e.*, a number of different trees have provided the seed. Yet completely good blocks of trees are known as

TABLE V.—NURSERY TREES.

Combination.	Buds Died or Did Not Grow.	Died Soon.	Died Second Season.	Trifoliata Scions Living.			
				Very Small. (1).	Medium (2).	Moderately Vigorous. (3).	Total.
Washington Navel (Bud 050) on Rough Lemon, Worked to—							
Trifoliata selection—48	...	7	...	4	3	...	14
" " 8	...	7	...	7	5	...	19
" " 22	...	6	...	7	6	...	19
" " 23	...	5	1	9	3	...	18
" " 49	1 Plus 1 (green).	1	1	1	6	7	18
Washington Navel (Bud 045) on Rough Lemon, Worked to—							
Trifoliata selection—22	1 green	2	3	...	7	2	15
" " 23	...	5	...	3	5	...	13

(1) Bud had grown only a few inches. (2) Bud had grown 8–10 inches. (3) Bud grew 10 inches before topping.

well as the more usual blocks where there is a percentage of stunted trees. Budwood for Washington Navel trees has, in the past, been taken almost entirely from trees on rough lemón stock. On the hypothesis that scaly butt virus in the scion affects trifoliata only, the appearance of a tree on rough

Fig. 11.—Union of Trifoliata Top-worked on Thompson Navel Orange, showing Scaling on Trifoliata.

lemon stock would give no indication as to how it would respond on trifoliata. If some trees carry virus and others are free, the usual practice of the commercial nurseryman of buying some thousands of buds cut from many trees gives ample scope for mixtures to occur.

In the case of three blocks of good Washington Navel trees on trifoliata, of which the propagational history is known, the buds were in each case obtained from a single parent tree, though stocks from a number of sources were used.

(*b*) *Effect of Scion on Stock Suckering and Union.*—Suckers are produced rather freely from the trifoliata stocks where no scaly butt develops. Many such suckers have been propagated by budding or by cuttings, and have grown vigorously, producing trees comparable with those grown from seed. On the other hand trifoliata stocks showing scaling verv rarely develop suckers. Of the many hundreds of such trees

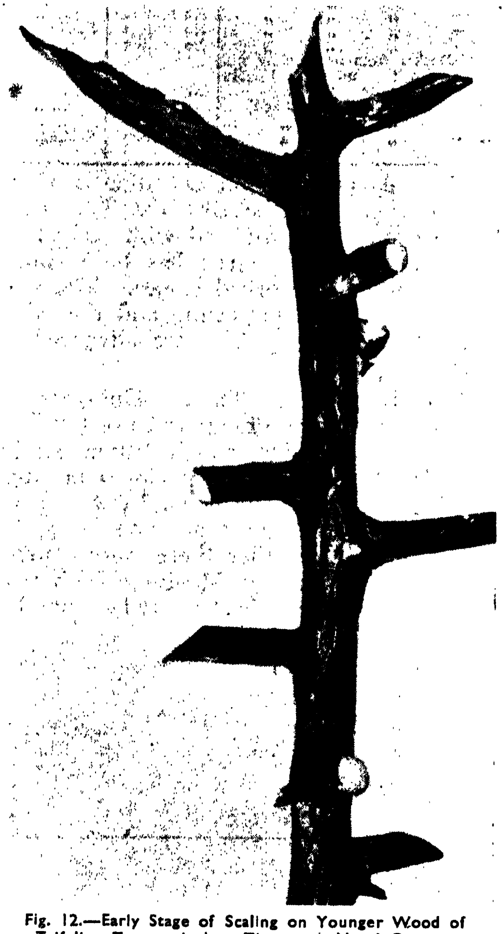

Fig. 12.—Early Stage of Scaling on Younger Wood of Trifoliata Top-worked on Thompson Navel Orange.

examined only two have been found to have produced suckers, and these have been very small and weak, recalling the growth habit of the smaller trifoliata on Washington Navel orange intermediate stem pieces already described.

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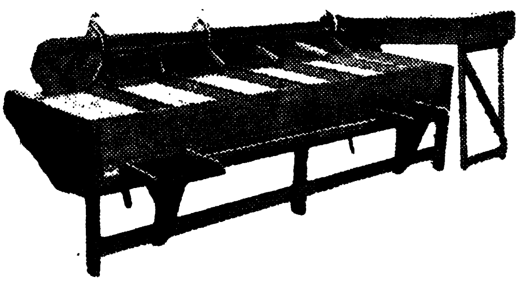

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The effect assumes more significance when it is coupled with the fact, already mentioned, that the stock and scion in scaly-butted trees are of about the same diameter and contrast sharply with the strong overgrowth and fluting of the stock that takes place in good combinations. These two facts indicate that in trees which eventually become scaly-butted, the factor responsible for it represses the growth of stock slowly and from an early age.

Fig. 13.—Reciprocal Working.
Trifoliata budded on Washington Navel intermediate on rough lemon rootstock; showing stunting, short internodes and small leaves.

(*c*) *Persistence of Scaling after Removal of Scion.*—Two cases have been observed where scaling has persisted after the Washington Navel scion has been removed. On one the scion was accidentally broken off shortly after planting out and the stock produced a sucker which is now scaling above the level of the original bud (Fig. 14). The growth of this plant is poor for the age of the tree—about twelve years. In the second, the scion died at the age of about fourteen years, evidently as the result of extensive death of roots, as the stock was in an advanced stage of scaling. A

Fig. 14.—Trifoliata Tree showing Scaling.
This tree resulted from the growth of the stock after the Washington Navel scion had been broken off when young. The stub of the scion is shown at *a*.

cluster of small suckers was produced and these have made three seasons' growth. Growth is comparatively very poor and scaling has started to show on the base of the largest sucker.

Summary of Effects Associated with Scaly Butt.

1. Scaly butt is typically a bud-union effect. It has not been seen on unworked trifoliata plants, nor has it been seen on any self-rooted scion varieties (lemons) which have or have had scaly rootstock.

One exception only to this general statement has been observed. A twelve-year-old lemon tree, originally on trifoliata stock had produced its own root system, and the trifoliata stock, which was scaling, had died. One of the lemon roots which had originated

(*Continued on page* 654.)

PLANT DISEASES

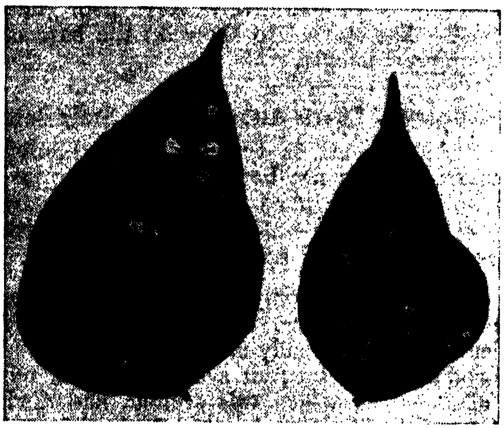
RUST OF FRENCH BEANS

Occurrence of a New Strain on Dwarf Varieties

BEAN rust caused by the fungus *Uromyces phaseoli typica* has long been a serious disease in New South Wales on certain climbing varieties, such as Epicure and Kentucky Wonder, but the main dwarf French bean varieties—Brown Beauty, Hawkesbury Wonder, Tweed Wonder, Wellington Wonder and Canadian Wonder—were, until last year, always free from rust except under conditions very favourable to the disease. In wet seasons and in shaded positions, a few rust pustules had occasionally been observed on the leaves of these varieties. It had been assumed that there were no races of the bean rust fungus in this country capable of causing serious damage to our main varieties of dwarf French beans, and for practical purposes, these were classed as resistant.

During October, 1948, a rust-affected crop of Tweed Wonder was seen at Berkeley Vale, in the Gosford-Wyong district. The severity of the infection, under the fairly dry weather conditions prevailing, suggested that a new strain of rust different from that previously encountered on Epicure and Kentucky Wonder was involved. This was confirmed by tests carried out by Professor W. L. Waterhouse at the University of Sydney.

Since then, the new strain of rust has been found in other localities in the Gosford district, and at Hawkesbury Agricultural College. Specimens of dwarf French beans affected with rust have also been received from the Murwillumbah district on the far North Coast. Varieties found affected to date have been Tweed Wonder, Brown Beauty, Wellington Wonder, Hawkesbury Wonder and Clarendon Wonder. The new strain has not yet been recorded in the seed growing areas on the South Coast.



Rust Pustules on the Dwarf Bean Variety, Wellington Wonder.

Symptoms of Rust.

Rust should not be confused with certain other bean diseases such as bacterial blight, angular leaf spot and anthracnose. Growers sometimes wrongly refer to these other diseases as "rust".

Although bean rust also attacks the pods and stems, practically all of the injury results from leaf infection. The first symptoms on leaves are small, pale yellow spots, usually less than 1/16th inch in diameter. A day or two after the appearance of the yellow spots, the surfaces of the spots become raised, and, some time later, small reddish-brown spore masses or pustules become visible. The pustules occur on the lower side of the leaf. Later, and less abundantly, they appear on the upper surface.

The reddish-brown pustules from which a reddish-brown dust—the fungus spores—can be brushed off, distinguish rust from

other bean diseases. Frequently a light yellowish-green halo develops in the leaf tissue around each rust spot and, viewed from a distance, the appearance of a leaf thus affected is not unlike halo blight, the most important of the bacterial blight diseases. When infections are very numerous the entire leaf yellows, and later withers and dies. Periods of wet weather contribute to the development and spread of the disease.

Control Measures.

In localities in which the new strain has not yet appeared, no control measures are required where any of the commonly-grown dwarf varieties are planted. However, the plants should be carefully checked for the presence of rust until they commence to flower and if any symptoms are observed they should be immediately dusted with sulphur or sprayed with wettable sulphur.

Where the new strain has become established in a district it is advisable to commence treatment two or three days after the beans emerge, and to continue at intervals of one to two weeks until a few days before the plants start to flower. The number of applications in such a case would vary from three to four or six, depending on the variety and the weather conditions.

In Florida (U.S.A.) it has been found that sulphur dust at rates of 15 to 25 lb. per acre per application has given good control of bean rust, provided that it is applied before the disease develops in epidemic proportions. A spray of wettable sulphur is also effective. Some injury to the flowers and young pods may occur if the treatment is continued after flowering. The same sulphur treatments should be given to climbing varieties such as Epicure. These sulphur treatments will also check red spider.

Rust spores are transported by wind from one crop to another and the amount of rust developing is liable to be considerably increased if an old rust-affected crop is near a later-planted crop. Consequently it is desirable to destroy by burning, or to plough under completely, any crop affected with rust as soon as all marketable pods have been picked.

At present it would appear that there are no dwarf French bean varieties of an acceptable commercial type resistant to the new strain of rust. Until such a variety is obtained either from overseas or by breeding work in this country it will be necessary for growers, in those districts where the new strain occurs, to adopt the control measures outlined above.

Oat Smuts

TWO distinct types of oat smuts, known as loose and covered smut, respectively, occur in New South Wales. Both diseases are caused by parasitic fungi. Loose smut, which is the more common, destroys the oat grain and enclosing glumes and replaces them by a black, soot-like powder of smut spores (Fig. 1). Covered smut differs in that the glumes are only partially destroyed, and in nearly all cases the black masses of smut spores remain enclosed within a thin, whitish membrane (Fig. 2).

Life-history of the Oat Smuts.

Although loose and covered smuts of oats are quite distinct diseases, their life histories are very similar, and for practical purposes may be considered together.

In the field, smut spores from an infected crop are spread by wind or harvesting operations on to healthy grains. These spores may lodge in the crevices, or merely adhere to the surface, of the grains. More important still, however, are the spores which fall on the flowers and, germinating there, establish the smut fungus in the outer coat of the grain itself. Under suitable conditions after sowing, the smut fungus develops and infects the young shoots of the growing oat plant. These infected plants show no signs of disease until heading time, when the fungus reproduces itself in the form of spore masses at the expense of the developing grain.

Control Measures.

Use of Smut-resistant Varieties:—

Fortunately, there are a number of oat varieties available which show good field resistance to smut. These include Ballidu, Belar, Brigalow, Bunya, Guyra, Kareela, Kurrajong, Lampton, Mulga and Sunrise. In addition, Dale and Gidgee show reasonably good field resistance.

Fig. 1.—Loose Smut of Oats.

On the other hand, farmers frequently desire to grow smut-susceptible varieties such as Algerian, Buddah, Burke, Fulghum and White Tartarian. These varieties can be grown free, or virtually free, of smut if adequate attention is given to seed treatment prior to sowing.

Seed Treatment of Oats:—

Seed treatment of oats prior to sowing should be adopted as a routine farm practice, particularly if the seed has been obtained from a smutted crop and the resultant crop is intended for grain purposes.

If oats are grown merely for feeding-off, there is no necessity to treat the seed since grain is not allowed to be produced.

The Formalin Treatment:—

Oat smuts can be effectively controlled by the use of formalin. This fungicide is likely to cause a certain amount of seed injury and the sowing rate of formalin-treated seed should be increased by 10 per cent. over the normal rate of seeding.

In addition to the possibility of seed injury and resultant lowered germination, the formalin treatment is somewhat tedious. Its use, therefore, is restricted to the treatment of comparatively small quantities of seed. Pure seed growers would be well advised to formalin-treat foundation oat seed.

Fig. 2.—Covered Smut of Oats.

The procedure is as follows:—

Place the grain on a tarpaulin or on a clean floor, and while shovelling, sprinkle with formalin (1 lb. formalin to 40 gallons water) until the grain is uniformly but not

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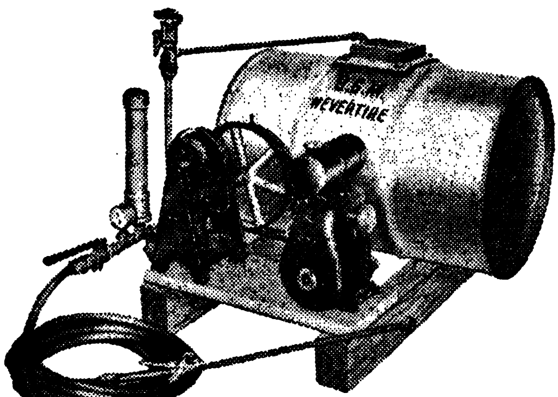

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excessively moistened. **A little less than a** gallon of solution will be required per bushel of seed. The **grain** should then be covered for 4 to 5 hours **with wet bags or** canvas to retain the gas. If the right amount of solution has been added, the grain will absorb the moisture and, though swollen, should run freely through the drill.

The grain should be bagged in clean bags to prevent re-infection.

When it is desired to treat small quantities, the grain may be dipped in formalin solution (1 lb. formalin to 40 gallons water), until the grains are thoroughly moistened, then removed, drained, and covered with bags as described above, but in this case it is difficult to dry the grain sufficiently prior to planting.

Grain should be sown as soon as possible after treatment with formalin.

Mercurial Dust Treatments:—

Certain proprietary dusts containing mercurial compounds such as Ceresan and Agrosan are of value for smut control. These preparations should be applied at the rate of 2 oz. per bushel.

Anthracnose or Ripe Rot of Fruits

ANTHRACNOSE, or ripe rot, caused by a number of species of the parasitic fungus *Gloeosporium*, may affect the fruits of a large number of plants including stone and pome fruits, bananas, papaws, mangoes, grapes and tomatoes. It can be destructive to fruits at all stages of growth, but is most troublesome just as they commence to ripen. Sometimes it causes heavy losses in stored fruits.

The type of rot is characteristic, consisting mainly of sunken, rounded spots which may later run together to form extensive black areas (see Figs. 1 and 2). Masses of spores are formed in pustules just beneath the surface. The spore-bearing areas on the spots frequently present to the naked eye an appearance of concentric rings and in most cases the spore masses are pink in colour. The spores are produced in very large numbers. They are capable of retaining their vitality when dry for long periods. If supplied with moisture, they germinate and can start fresh infections; thus affected fruits on trees or vines are important sources of new infections.

Infection is believed to take place at any stage of growth of the fruit, including very young fruit, and the fungus may remain dormant or latent until the fruit is approaching maturity. Weather conditions during the season and at harvest time greatly influence the amount of loss from this disease. Losses are heaviest in warm, moist seasons.

The various species of the fungus which cause ripe rot are also able to attack weakened twigs, canes, and in the case of bananas, spent leaves. By this means huge spore loads of the fungus may be built up in neglected orchards and plantations. If leaves or twigs are injured by frosts or cold winds, infection by *Gloeosporium* may occur and later provide sources of spores for developing fruit. With bananas, frost or cold wind injury of bunches of fruit in the plantation is usually followed later by severe development of ripe rot after the fruit enters the ripening room.

Control Measures.

1. Regular use of fungicidal sprays, such as Bordeaux mixture applied to apples and grapes, reduces the amount of infection by

Fig. 1.—Anthracnose or Ripe Rot of Mango, showing Characteristic Black, Slightly Sunken Areas on the Skin.

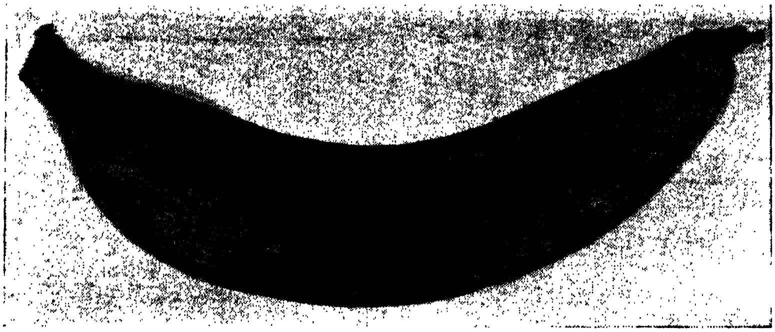


Fig. 2.—Banana Anthracnose following Winter Injury.

the ripe rot fungus. Such sprays are usually applied as routine sprays in the control of other diseases.

2. Losses from ripe rot are less severe in orchards that are regularly pruned and fertilized. In banana plantations regular trashing of stools to remove spent leaves is recommended. With tropical fruits such as the banana, mango and papaw, selection of warm sheltered sites for plantations is likely to result in less loss from ripe rot. Plantations of high altitude should be avoided.

3. Care should be taken in gauging the maturity of fruit at harvest, particularly if it is to be despatched to a distant market or stored for long periods. Fruit of even maturity and slightly below prime condition should be chosen. Mature fruit may be suitable for a local market but will be subject to loss on a distant market.

Tuber Transmission of Blackleg of Potatoes is Unlikely.

A TEN to twenty per cent. infection of blackleg disease in certified seed of Sebago potatoes in the Clarence River district this spring has raised the question of whether the disease can be transmitted by tuber.

According to the Biological Branch of the Department:

While tuber transmission is possible, it is not a common source of infection and no clearcut case is known to have occurred in the movement of tableland-grown seed to the coast.

Blackleg is caused by a number of strains of *Erwinia carrotovora*—which are universal in distribution, and also the cause of soft rot of vegetables.

The disease is liable to occur in flooded or saturated soils, or following deep planting in heavy soils; under such conditions there is insufficient oxygen to allow proper development of wound cork.

Cutting the sets increases the danger of blackleg.

This outbreak in Sebago may indicate a varietal susceptibility to the disease, or that the unusually-large size of available Sebago seed exposes too large a surface to infection by soft rot organisms.

Factor and Katahdin crops growing in the same area, on the other hand, have been relatively free of the disease.

Good Results Against Bruchus Weevil.

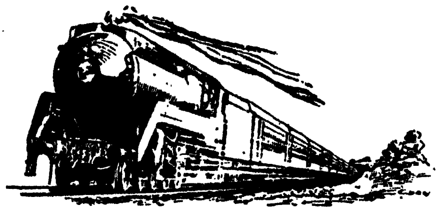
A SMALL quantity of the fumigant trichloroacetonitrile (known commercially as "Tritox" in Germany), received recently by the Entomological Branch of the Department gave good results in an initial test against the Bruchus weevil.

The chemical was used overnight to fumigate a sample of bean seed badly infested with this weevil—and was applied at the rate of 2 lb. per thousand cubic feet.

It gave a complete kill of the beetles.

The Department plans to conduct further experiments with this chemical as stocks of infested seeds, flour and grain become available.

This fumigant is not easily inflammable—open fires and electric sparks being stated as not presenting any danger of explosion—and has therefore a considerable advantage over carbon bisulphide in this respect.



AN AIR-CONDITIONED EXPRESS ON THE ILLAWARRA

South Coast Daylight Express services between Sydney, Wollongong, and stations from Kiama to Nowra are now provided by an air-conditioned train similar to those operating between Sydney and Newcastle.

The running of this modern express makes it possible to plan an enjoyable one-day trip on the scenic South Coast. Mondays to Saturdays the express leaves Sydney at 9.12 a.m., and arrives in Nowra at 12.37 p.m. and, on the return journey, it leaves Nowra at 1.56 p.m. and arrives in Sydney at 5.18 p.m.

Seats must be reserved on this express. It is well to remember that reservations may be made up to fourteen days in advance of travel and that it is desirable to specify whether smoking or non-smoking accommodation is required.

S. R. NICHOLAS,
Secretary for Railways.

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(*Established* 1914)

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"ESA" BLUESTONE (COPPER SULPHATE) IS IDEAL FOR THE FOLLOWING USES:

Preparation of Spray Mixtures for Fruit Trees and Vines

For Sheep: Treatment of Foot-Rot; as a Drench for Worms

As a Drench for Scour in Calves

For Wheat Pickling

Write for Booklet — "Better Yields by Spraying with 'ESA' Bluestone"

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The SPRAYMASTER

Price, £103 17s. 6d.

SPRAYMASTER

POWER SPRAYS

All models are operated by reliable COOPER 1 h.p. Petrol Engine operating for 11 hours on 1 gal. petrol.

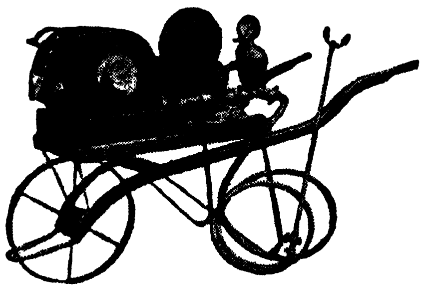
Fitted with PRESSURE CHAMBER, PRESSURE GAUGE, RELEASE VALVE, one Set SPRAYROD HOSE COCK and NOZZLE.

THE SPRAYMASTER has Vertical double action Pump operating at maximum pressure of 350 lb. square inch with double spray jet. Fitted with 40 to 60 gal. barrel, with internal propeller agitator. Mounted on solid frame fitted with 18 in. x 3 in. Iron Wheels, Turntable and Towing Bar. May also be supplied on frame or slides without wheels.

THE SPRAYMASTER JUNIOR has single action vertical Pump operating at maximum pressure of 270 lb. square inch, designed for economical spraying at pressures of 100 to 150 lb. square inch, with double spray jet. Is mounted on wheelbarrow chassis, easily moved in inaccessible places. Spray material is drawn from conveniently situated containers by suction hose. May also be supplied on frame only, with handles.

The SPRAYMASTER JUNIOR

SPRAYMASTER UNITS are suitable for Orchard and Garden, high pressure spraying, low pressure spraying, Sheep Jetting, Fire-fighting, Spraying Farm Buildings and Whitewashing.



Price, £66 17s. 6d.

All Brands of Modern Insecticides and Fungicides, including D.D.T. Benzene Hexachloride, Hexaethyl Tetraphosphate, Copper Sprays, Colloidal and Dispersible Sulphur, Seeds, Garden and Spraying Hose, Knapsack Dusters and Sprayers, Rotary Dusters, etc.

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INSECT PESTS.

Notes contributed by the Entomological branch.

THE HOUSE FLY

(*Musca domestica*)

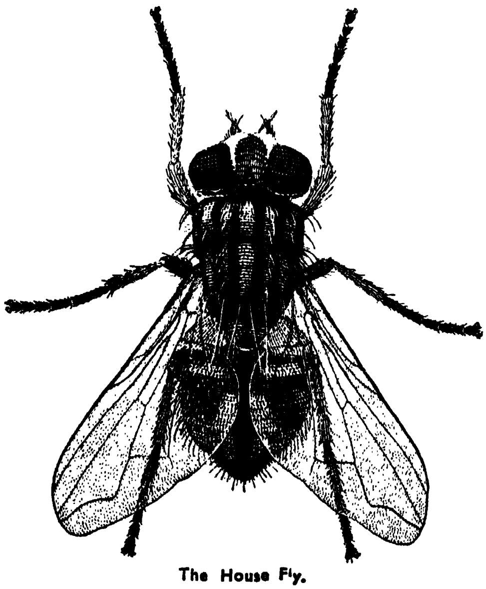
●

DURING the warmer weather, where sufficient moisture is available, flies develop quickly and may become extremely numerous. Several species of flies invade dwellings, and are popularly referred to as house flies. The most important and widely distributed, however, is *Musca domestica.*

The small fly, which is so annoying in the open, is not a house fly, but a closely related species, which does not invade houses.

House flies, in addition to the physical discomfort they cause, are a menace to health. From garbage heaps, stables, lavatories and decaying matter, they pass into dwellings. They have been shown to carry a number of diseases serious to man, including typhoid, tuberculosis, conjunctivitis, infantile diarrhoea, dysentery, anthrax and ophthalmia.

The house fly prefers horse manure in which to deposit its eggs, and four to six batches, each of which may contain as many as 160 eggs, may be laid by a female during its lifetime. The eggs hatch in about eight to twelve hours, and the maggot, which feeds for several days, enters its pupal or



The House Fly.

Egg Masses of the House Fly.
Slightly enlarged.

Larvae or Maggots of the House Fly.
Slightly enlarged.

chrysalis stage within a small brown puparium, which is formed from the last larval skin. During warm weather the life-cycle from egg to adult may take only fourteen days or less, so that many generations can develop during a season.

Control.

Destruction of the breeding grounds, particularly in the vicinity of dwellings, is an important factor in reducing the numbers of flies.

The most effective means of keeping flies out of dwellings is by thorough screening with ordinary fly gauze. Although many country dwellings are screened, the screening is so imperfectly carried out that it is of little value. As well as the screening of all doors and windows, it is essential to ensure that all ventilators, and grooves beneath galvanised iron, are covered, while care should be exercised to see that all screen doors and windows are made to fit perfectly.

Flies will congregate on the gauze door of a kitchen and will pass into the room in large numbers whenever the door is opened. This can only be prevented by gauzing in a verandah on to which the kitchen opens or by constructing a special gauzed-in porch outside the kitchen door.

Within the house, flies may be destroyed by spraying, poisoning, trapping, and by the use of fly papers.

A kerosene-pyrethrum spray, which is effective for fly control, may be prepared with the following materials:—

Pyrethrum powder	4 oz.
Kerosene	1 quart
Methyl salicylate—(Synthetic oil of wintergreen)	¾ fluid oz.

Place the pryrethrum powder in the kerosene, mix and shake well, then allow to stand for about twelve hours. Strain through fine muslin and add the methyl salicylate, after which the spray is ready for use.

A small amount of DDT is usually added to fly sprays, but in order to obtain a residual or lasting effect, a concentrated DDT solution is necessary. This residual spray is available as a 4 per cent. DDT in deodorised kerosene and is applied to walls, window frames, light fittings, and places on which the flies usually rest, by means of an atomizer or brush. Surfaces should be thoroughly moistened, so as almost to run off, using 1 quart to each 250 square feet.

Puparia of the House Fly.
Slightly enlarged.

DDT is poisonous and should be kept away from foodstuffs. It may be absorbed through the skin when it is dissolved in kerosene, and the hands should be thoroughly washed after using such a mixture.

An efficient and safe poison bait consists of the following:—

Clear lime water—½ pint.
Sugar—1 heaped tablespoon.
Formalin (40 per cent.)—2 tablespoons.

To the above solution add sufficient tap water to make 1 pint of liquid.

This bait should be placed in small tins or bottles fitted with cloth wicks, or may be set out in shallow vessels, in which a square of bread or other substance may be placed, upon which the flies can alight.

Stable refuse should be kept in properly-constructed covered bins, and should be emptied and carted away at least once every week. Large quantities of manure on a garden, uncovered with earth, will increase the number of flies.

Fly larvae may be destroyed by the use of the following solution:—

Borax	4 oz.
Water	1 gallon.

This amount is sufficient to treat 4 cubic feet of horse manure. Manure treated with this quantity of borax, however, is not suitable for garden use.

An alternative treatment is the application of ½ lb. each of calcium cyanimide and superphosphate per bushel (2 kerosene tins) of manure. This mixture is scattered over the heap and then watered in. This treated manure containing fertilizer is suitable for garden use.

Creosote and other types of oils have been used as surface applications, but the newer insecticides, DDT and BHC, appear to offer a more direct method of both fly and maggot control.

Five per cent. dusts, applied at the rate of 1 oz. per 2 square yards of manure, are suggested. DDT is likely to be the more persistent, but BHC is regarded as a more effective killer of maggots.

Powdered borax, DDT or BHC dusts, should be used frequently in pans in unsewered areas to prevent fly breeding.

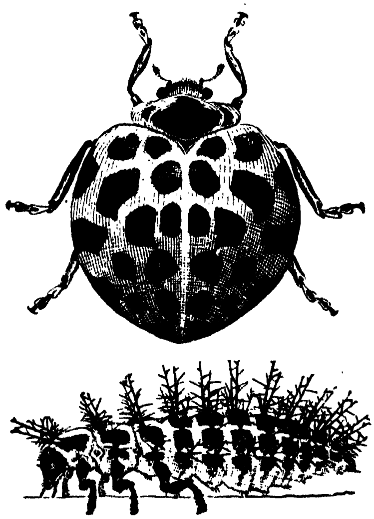
The Leaf-eating Ladybird

(Epilachna 28-punctata)

DURING the past month the larvae of the leaf-eating ladybird have been prevalent and numbers of reports of damage to potato foliage have been received.

Both the adults and the larvae of this ladybird feed upon the upper surfaces of the leaves, causing them to become skeletonised and discoloured.

Although this ladybird feeds chiefly upon the foliage of different species of the genus *Solanum*, such as potatoes and tomatoes, it also attacks melons, pumpkins and other related plants and at times causes as much damage as the pumpkin beetle (*Aulacophora hilaris*).



Adult and Spiny Larva of the Leaf-eating Ladybird Beetle.

The pale yellowish, spindle-shaped eggs are deposited in small groups upon the upper surfaces of the leaves. The stout-bodied, yellowish larvae, which measure

about ¼ inch in length, are readily identifield from all other grubs by the fact that the upper surfaces of their bodies are covered with branched black spines.

When fully-fed, the larvae congregate in masses on the foliage of their food plant, attach themselves (side by side) to the leaves, and there enter their pupal or chrysalis stage.

The adult ladybird is of a uniform, orange-yellow tint, closely spotted with twenty-eight irregular black dots. The adult should not be confused with the somewhat similarly coloured carnivorous species, *Leis conformis,* which is one of the most useful aphid-eating ladybirds. This beneficial species, which is a more active beetle, possesses only sixteen to twenty (usually eighteen) black spots.

Control.

On potatoes and tomatoes—

2 per cent. DDT dust, *or*

a spray consisting of DDT emulsion (20 per cent.) 4 fluid oz. to 5 gallons of water, *or* dispersible DDT powder 1½ oz. to 5 gallons of water,

may be used.

Pumpkins, melons and related vine crops are subject to injury from DDT, particularly in the dust form. A light spraying with DDT at a concentration of 2 fluid oz. of emulsion (20 per cent.) to 5 gallons of water, may be given without seriously affecting the growth of the plants.

Where available, pyrethrum powder one part, mixed with four parts (by weight) of kaolin or flour, *or* calcium arsenate, one part, mixed with fifteen parts of hydrated lime, may be dusted on to the plants.

Stunting and Scaly Butt of Citrus—*continued from page* 645.

adjacent to the stock showed a bark condition over a length of 2 feet which exactly resembled scaly butt.

Two cases have been seen where scaly butt has persisted in the trifoliata plant after the removal or death of the scion.

2. In experiments, scaly butt has been produced from union with affected material in inarches, and buds and with presumably affected material in reciprocal working (topworked mature trees, and nursery trees).

3. When transferred by buds from scaly butt affected trees, scaly butt associated with stunting showed up by the time the young trees were six years of age. When transferred by union with scaly butted Washington Navel into inarches, scaling was first observed at four years of age. When trifoliata scions were topworked on presumably affected Thompson Navel trees, scaling first appeared at five years of age.

4. In orchard plantings sucker growth is practically inhibited and stock growth is obviously repressed, in scaly butt affected trees.

5. When worked on to nursery trees of Washington Navel intermediate on rough lemon stock it was noted during the first and second season that—

(*a*) Failures and early death of the trifoliata scion were abnormally high.

(*b*) There was considerable size variation among those that grew; and

(*c*) Where growth was stunted, the trifoliata had short internodes and small leaves,

but when worked directly on to rough lemon stock, notably vigorous trifoliata nursery trees were produced.

(*To be concluded.*)

THE Minister for Agriculture, Hon. E. H. Graham, M.L.A., has announced that the New South Wales Government has donated £1,000 as a first instalment towards the cost of erecting a Memorial Library at Hawkesbury Agricultural College. The library is being erected by the College Authorities and Old Boys' Union to commemorate the part played by students and ex-students in World War II.

Here's to 1950!

THE HALF CENTURY

We hope that the year will provide happy, prosperous times.
Meanwhile, we offer you

Hearty Good Wishes
for
Christmas and New Year

Bright care-free days, brimful with cheeriness

Winchcombe, Carson Ltd.

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Newcastle, Yass, Harden, Orange, Forbes, Coonamble, Bourke, Armidale

A Woolclassing Course for Woolgrowers

AND OTHERS!

The Howard Correspondence College Course of Woolclassing affords woolgrowers the opportunity to get peak prices for their wool. It offers a complete practical training and special assistance in the preparation of the clip at shearing time.

Instruction includes hundreds of staples of wool, grown nation-wide, on your own table for study and exclusive handling; each staple described by the growers for breeding and season, and by our experts for quality, etc.

Read the remarks inset:—

A GROWER said—"I learned more in one month's study than in all the years I have been in the wool industry."

ANOTHER GROWER calculated the course brought him £250 extra on the first clip solely through our help, and asked—"How much have I lost in the past 25 years through faulty clip setting?"

A STUDMASTER said—"Since I have taken the course, the improvement in the flock itself and the price per pound of wool has increased almost double."

A MAN PREVIOUSLY OUTSIDE THE WOOL INDUSTRY said—"I did realise while doing your course what a wonderful College yours was, but realisation became amazement . . . your curriculum covers everything, even to the minutest points for sheepmen and woolclassers."

ANOTHER GROWER said a friend was amazed at the progress he made in such a short time and described the course as "Woolclassing made foolproof."

Howards' have students in every corner of Australia, and as far afield as Europe, Peru, South Africa, the U.S.A., Kenya Colony, Argentina, Canada, England, Italy, New Zealand, and India . . . BECAUSE—

Better preparation of the clip means a bigger wool cheque
Thorough knowledge of wool means improved flocks

Airmail or write for particulars today, and mention this paper and date

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FASTER ACTING - - - CONCENTRATED

SHEEP FLY DRESSING

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definitely
KILLS MAGGOTS QUICKER!

- 3 TIMES AS EFFECTIVE IN ITS ACTION
- LEAVES WOUNDS CLEAN AND HEALTHY DUE TO SULPHANILAMIDE CONTENT
- CONTAINS D D T FOR POSITIVE PROTECTION AGAINST RE-STRIKE
- SCOURS OUT EASILY — CAN'T HARM THE WOOL
- USE FOR JETTING, SPRAYING AND DRESSING

KLEEP is something new in blowfly dressings, but already enthusiastic users report . . .

". . . have found it to be most efficient fly dressing yet produced."

". . . when Kleep was applied all maggots were killed very quickly . . . no trouble with re-strikes."

"Kleep" definitely kills maggots. . . ."

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¼ gallon & 1 gallon tins
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COMBAT FLY STRIKE

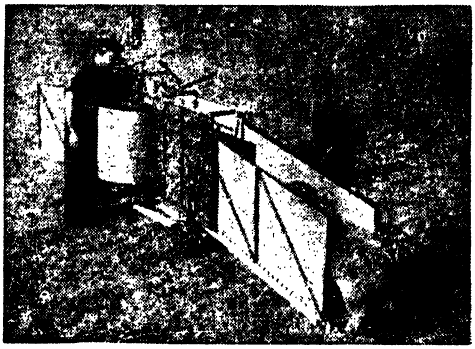
quickly and efficiently

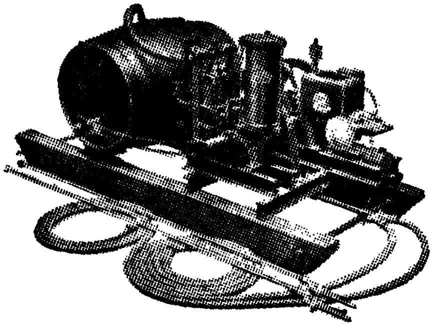
by Spray Jetting with a Buzacott Spretter

Invented by two well-known graziers Messrs. Clapham and Moore the Spretter ensures speedy, economical and simple protection for sheep against fly strike.

The specially designed crutch spraying saddle provides positive protection by directing the jets at the most vulnerable parts.

Easily portable, the pump unit is an excellent firefighter and dual purpose plant.





by Jetting with Buzacott Jetters

Two models are available from stock. The unit illustrated powered by a 2 h.p. Buzacott Engine with high pressure pump and the Buzacott Marino Jetter driven by a 1 h.p. Air Cooled Engine.

The former may be moved about on the skids. The MARINO being lighter can be placed in a truck or utility for movement from place to place.

with Buzacott Jetting Fluid and Fly Dressings

"SPRETTER" fluid is a special Buzacott line prepared for jetting with all types of machines. A Sodium Arsenite mixture is non-clogging and non-abrasive and gives excellent penetration and good protection

D.D.T. and B.H.C. Fly Dressing

Non-arsenical, embodying D.D.T. and "Gammexane" soothing, antiseptic, repels fly and kills in egg, maggot and fly stages. Affords protection against re-strike for four to six weeks.
1 gallon makes up 7 gallons.
Price, 19/3 per gallon tin :
£3 7s. 0d. per 4-gallon drum.

B.K.B. Fly Dressing

Based on C.S.I.R. formula. Ready for use. Non-arsenical. Kills rapidly. Does not harm the wool.
Price 9s. per gallon tin :
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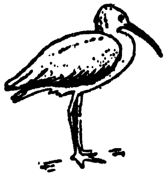

21% LIME (CaO)
42% $CaCO_3$

18% MAGNESIUM (MgO)
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The Most Efficient Soil Corrective

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IBIS DOLOMITE containing LIME and 36% MAGNESIUM CARBONATE gives *BETTER* RESULTS than ORDINARY LIMES or DOLOMITES with LESS MAGNESIUM.

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Apply for Information and Price to your nearest Agent or

METROPOLITAN LIME & CEMENT CO.

Commerce House, 125 Adelaide Street, BRISBANE.

DESTROY RABBITS with the "BEST" BURNER

Mr. S. D. Klante of Eyre Peninsula, South Australia, who developed this method writes:

"Regarding the fumigation of Rabbits with a 'Best' Burner, the method used is to place a teaspoonful or so of sulphur in the mouth of the burrow and focus the Burner in to the same hole and, as the smoke emerges from the other holes, shovel them in giving a fair coating of dirt, to discourage any outside rabbits from reopening the warren.

"We have found this method 100 per cent. effective and the 'Best' Burner is an ideal one man unit, as it enables one to fill in several holes before it requires further pumping."

"Best" Burner £12-15-0 each
F.O.R. SYDNEY

Sulphur 30/- cwt.
(IN 180-lb BAGS)

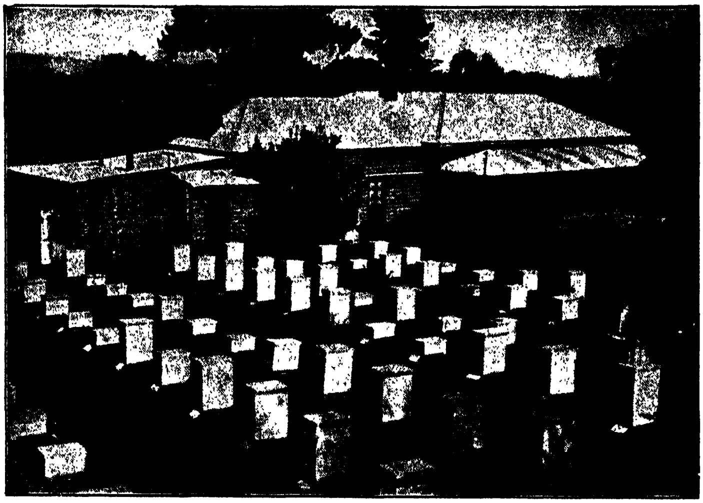
F. W. WILLIAMS & Co. Pty. Ltd., 16 Loftus St., Sydney

APIARY NOTES

WELL-PLACED APIARIES

Avoid Complaints

The Department's Liaison Service



A Large Apiary in Close Proximity to a Home.
It causes no inconvenience to the family, which includes several small children.

IN the interests of the welfare of the bee-keeping industry, the Department, has, in addition to its educational and inspectorial duties, a wide range of other activities.

One of these is co-operation in a scheme to adjust differences when there is a danger of friction between bee-keepers and other members of the community, the Department acting in a liaison capacity.

It is necessary also, at times, to co-operate with most other government departments, and with shire and municipal councils when matters of importance concerning bees arise, and on occasions with private companies to ensure that they gain a thorough understanding of the needs of the industry when the provision of a reasonable share of essential base materials for bee-keepers' supplies is being considered. As a result of the representations made on such occasions, more and more influential people are becoming conversant with the needs and importance of the bee-farming industry, and, in consequence, there is greater inclination to co-operate and render assistance when it can be given.

Individual Complaints Are Investigated.

It is not intended in these "Notes" to go into details concerning the various activities referred to, but one or two phases of the co-operative work might be discussed with interest to bee-keepers generally.

For instance when a complaint concerning bees causing trouble arises, the Local Government Department recommends that the municipal or shire council concerned first bring the complaint under notice of the Department of Agriculture for investigation and possible amicable settlement.

This scheme was adopted several years ago following a conference on the matter between representatives of the Local Government Department, the Commercial Apiarists' Association, and the Department of Agriculture.

The main purpose of the scheme is to have individual complaints dealt with, and to avoid, as far as possible, any necessity for councils to take action on broad lines such

as may affect the bee-farming industry generally. Actually the scheme has been operating very well in practice, as in practically every instance where a complaint has been brought under the notice of the Department, it has been possible with the co-operation of the council and bee-keeper concerned to arrange an amicable settlement.

Bees Should Not be Placed Near Schools.

Some justifiable individual compliants do, of course, need investigating. Take, for instance, a recent case in which a bee-keeper

Several Hives of Bees are Kept in this Suburban Backyard, Without Troubling the Neighbours.

established an apiary alongside a country town school to which many students rode their horses and kept them during the day in the school grounds. The restless horses, and the activities of the children during playtime were, in any case, likely to disturb the bees, and it would be impossible to anticipate what childen would do under the circumstances.

It should be obvious to any bee-keeper that colonies of bees placed near a school would be likely to give rise to complaints. At the request of the Department the bee-keeper rapidly removed the hives.

Racehorses and Bees Do Not Mix.

Another individual case occurred when a bee-keeper established hives of bees close to a small allotment on which racehorses were kept. Any experienced bee-keeper would certainly know that high-spirited racehorses and bees would not mix. A few bees ordinarily flying around the place would prove sufficient to upset such high-strung animals, particularly when enclosed in a small area.

Hundreds of people keep bees on farms, and the colonies do not cause trouble amongst farm animals, which are not of a very nervous disposition. This complaint was also settled to the satisfaction of both parties.

Some Complaints are Not Justified.

On the other hand, some investigations have revealed trivial causes of complaint. In some instances it was found that no trouble had been experienced between the bee-keeper and his neighbour over a period of years—until some members of each family became very unfriendly towards each other. Another case investigated proved that a number of school children were catching bees on Cape weed flowers and several of the less "expert" were stung; the Department did not consider this a reasonable cause for complaint against a bee-keeper who was properly caring for bees in a nearby holding.

Forethought and Tolerance Solve Most of the Problems.

Summing up the matter it is considered that dealing with individual complaints in this way is the right course, even though calls are made on Departmental officers at times when pressure of other important work is rather heavy. It has worked well in the past, and it is hoped that the scheme will be continued, rather than that resort should be made to general prohibition on the keeping of bees in certain areas, for the latter will surely affect a large number of careful bee-keepers whose bees do not cause any trouble.

All that is required is some forethought on the part of the bee-keeper so that he does not establish his hives where they are likely to disturb people, and just a little tolerance by members of the public, as they increasingly

realise what they owe to bees for the production of honey and beeswax, and for an essential pollination service in the production of fruit, vegetables, and crop-plant seeds.

From the Department's experience too, it is strongly recommended that the bee-keeper and his family make every endeavour to keep on friendly terms with neighbours.

CONSIGNMENT OF HONEY TO QUEENSLAND.

Certificates Are Necessary.

The consignment of honey to Queensland from New South Wales has increased considerably of late, having reached an average of over 300,000 lb. per month, principally from northern districts. Some trouble has recently been experienced with bee-keepers new to this trade, who are not conversant with the Queensland Regulations, which require that each consignment of bees, honey, material or appliances shall be accompanied by a certificate.

The certificate is Form No. 7 under the Queensland Apiaries Act. In this form particulars concerning the consignment must be given, and a declaration signed by the sender of the honey. To facilitate the issue of certificates the New South Wales Department has appointed a number of officers authorised to sign the Departmental section of the form. Authorised officers appointed for this purpose are as follows:—

Mr. F. Ainsworth, Inspector-in-Charge, Stanthorpe.

Mr. A. I. Gillespie, Killarney Crossing.

Mr. E. L. Carpenter, Wallangarra Crossing.

District Veterinary Officer, Grafton.

Inspector of Stock, Casino.

Inspector of Stock, Lismore.

Inspector of Stock, Grafton.

Inspector of Stock, Inverell (D. Rennell).

Inspector of Stock, Glen Innes (G. Charles).

Inspector of Stock, Texas (L. E. C. Scott).

Gatekeeper J. Newley, Gullendore Border Crossing, Cullendore, via Warwick, Queensland.

Relieving Assistant J. J. Whitney, c.o. F. Ainsworth, Box 155, P.O., Stanthorpe.

H. C. Wentworth, P.P. Board Office, Inverell.

N. H. Litchfield, Inspector of Stock, Tenterfield.

Who's Afraid of Bees!

Stanthorpe Section—

B. N. Hicks, Riverton Border, Crossing, via Tenterfield.

F. K. Barlow, Relieving Assistant, c.o. Box 155, P.O., Stanthorpe, Queensland.

Head Office, Sydney—

W. A. Goodacre, Principal Livestock Officer (Apiculture).

D. L. Morison, Veterinary Officer (Apiary Branch).

The Procedure to be Adopted.

These officers are conversant with the procedure approved by the Department for the completion and issue of the certificates, but if bee-keepers who desire to send honey and/or bees to Queensland also make themselves familiar with the requirements, as indicated below, and extend their co-operation, the issue of the certificates will be greatly facilitated.

Certificates are made out in triplicate, one being marked "Original," one "Duplicate," and the third "Head Office Copy."

The form marked Original," when completed, is handed to the bee-keeper in exchange for a cheque, postal note, or money order made payable to the New South Wales Department of Agriculture, for the amount of fees involved. In the case of a cheque, exchange must be added. The "Duplicate" copy, initialled by the authorising officer, is also handed to the bee-keeper, and is to be forwarded by him to the Department of Agriculture and Stock, Brisbane, Queensland. The Head Office Copy with remittance covering fee, is to be forwarded by the authorised officer to the New South Wales Department for record and audit purposes.

The scale of fees for each consignment of honey is as follows:—

1 to 120 lb. of honey	1s. 6d.
121 to 480 lb. of honey	2s. 6d.
Over 480 lb. of honey ..	5s. 0d.

No fee is charged for the issue of certicates in connection with the consignment of bees to Queensland, but the Head Office copy of any certificate issued is required at the Department for record purposes.

Under the heading of "description" in the schedule to the certificate, the number of hives of bees or quantity of honey must be stated. If honey is being consigned, the name and address of the consignee must be given in the last section of the schedule, and where bees are being moved to Queensland location of the apiary to which they are being sent must be stated.

Grain Elevators and Railways Set Records in Wheat Handling.

DURING the past two wheat seasons, 1947-48 and 1948-49, the N.S.W. Government Grain Elevators handled over 100 million bushels of wheat. In the same period the N.S.W. Railways transported over 134 million bushels of wheat from the country to the seaboard, flour mills, etc.

In releasing these figures the Minister for Agriculture, Hon. E. H. Graham, M.L.A., said that both the Government Grain Elevators and the Railway Department had set all-time records in wheat handling during the past two seasons, and silos had been empty and ready to receive this season's wheat.

"These records were achieved notwithstanding the heavy wastage in railway rolling stock and engine power as a result of the war, the unfavourable conditions experienced during the 1947-48 harvest and the restrictions in rail transport services caused by floods, coal shortages, etc.," said the Minister.

"They were only made possible by the close collaboration which existed between the Australian Workers' Union, the Railway Department, the Department of Agriculture and wheatgrowers," he concluded.

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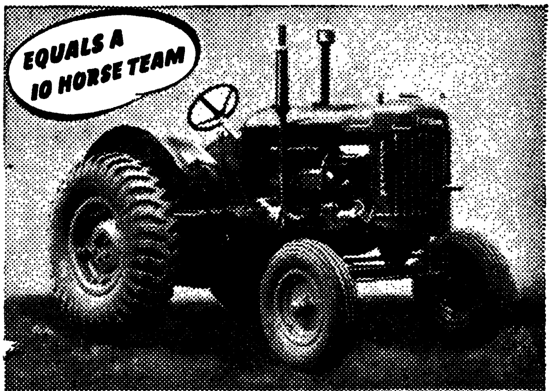

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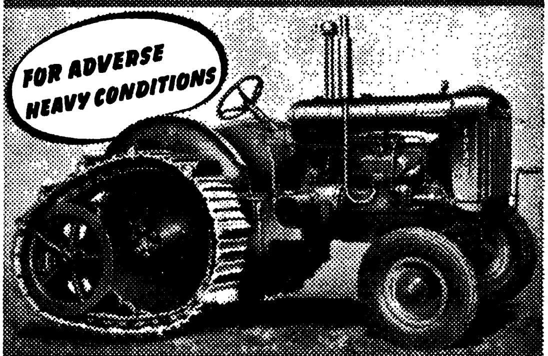

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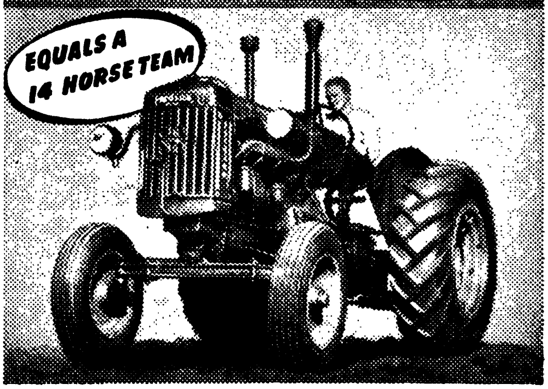

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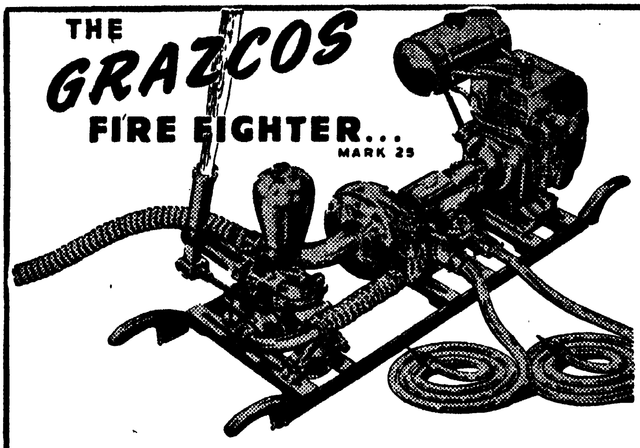

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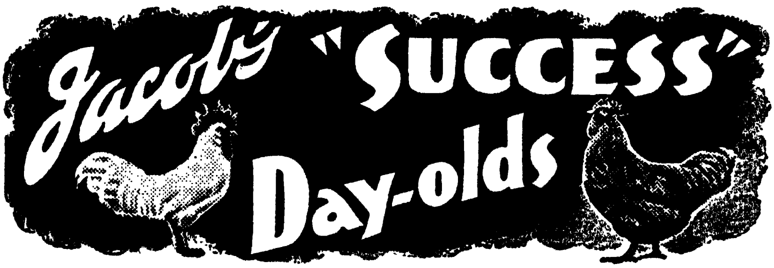

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The Administrative Block at Poultry Experiment Farm, Seven Hills.

POULTRY NOTES

SOYBEANS AS GREEN FODDER FOR POULTRY

W. JOHNSON, Foreman, and REGINA FORGE, Field Assistant,
Poultry Experiment Farm, Seven Hills.

THE prominence which has been given to the value of soybeans as a green fodder crop for livestock, has lead to inquiries as to its value as a green feed for poultry. An experiment undertaken at the Poultry Experiment Farm, Seven Hills, has indicated that the soybean plant is a very useful summer green feed crop. It is, however, somewhat slow maturing and does not make second growth after cutting.

Details of the Trial.

The soybean seed was sown in a suitably prepared plot on 5th November, 1947, and after a favourable season the crop was sufficiently advanced to enable the trial to be commenced on 27th January, 1948, when the first cutting was made. Sixty White Leghorn hens (hatched 1946) were randomised into six pens of ten birds each under the intensive system of feeding. The birds in three pens were fed lucerne green feed and those in the three alternate pens, chaffed green soybean plant. The green feed was fed at mid-day in troughs and was before the birds *ad lib.* until dusk. Each group was fed the following all-mash ration in self feeders:—

	Per cent.
Wheat meal	54½
Bran	15
Pollard	15
Meat meal	10
Peanut meal	5
Salt	½

In all pens the mash hoppers were closed for one hour at mid-day to encourage the consumption of green feed.

The Green Lucerne Pens.

At the commencement of the experiment, lucerne in flower was cut, chaffed and fed and the consumption averaged about 1¾ ounces per bird. During February, when succulent lucerne which had not reached the flowering stage was fed, a marked drop in consumption occurred to less than 1 ounce per bird; in late February and early March, when lucerne in flower was again fed, consumption rose again to normal.

It has also been observed on the Farm that poultry will not eat the leaves of lucerne growing in the colony enclosures, until the plant has flowered.

Green Soybean Pens.

The soybean crop was cut, chaffed and fed from just before flowering to the stage at which the bean pods were 3 inches long; throughout the trial it was readily eaten by the birds. During growth the plants were not subjected to any apparent attack by pests or disease and the crop yielded approximately 18 tons per acre. The soybean plant is of a large, succulent, stalky nature and it was not practicable to feed it unchaffed under experimental conditions.

Summary.

Soybeans proved to be palatable, prolific and was easily harvested and fed as green feed for poultry, but possess two disadvantages—they are somewhat slow in maturing and only produce the one crop, no second growth being made after harvesting.

FEEDING TRIALS WITH SOME WEED SEEDS AND GREEN WEEDS

Previously Considered Likely to Cause Trouble in Poultry

J. N. WHITTET, H.D.A., Principal Agronomist (Pastures) and H. M. GREAVES, H.D.A., Livestock Officer (Poultry).

AT times reduction in egg production and mortality in fowls have resulted from feeding wheat and other grains which contain weed seeds as impurities.

Attention was drawn to these Notes in October, 1942, to the danger of feeding wheat containing Mexican Poppy seed, following losses on farms and the carrying out of feeding tests at Glenfield Veterinary Research Station.

As large numbers of weed seeds and green plants of weeds are brought to the Agrostology and Poultry Sections of the Department for determination as to whether the material is harmful as feed, it was decided to conduct some preliminary feeding tests with various weed species at the Poultry Experiment Farm, Seven Hills.

This experiment was divided into three sections, using:—

(A) Seeds of certain noxious and other weeds which are common impurities of wheat grain and grain sorghum.

(B) Green weeds which grow in green feed crops; and

(C) Green fodder crops, sorghum and Sudan grass, which are cyanogenetic in their early stages of growth.

Notes on the Weed Seeds Fed.

Seeds of the species listed below were utilised in the test, being ground and fed in the mash. In the case of Bathurst and Noogoora Burrs, the seeds were enclosed in the large, hard seed pods and the latter were ground and fed in a similar manner.

Bathurst Burr (*Xanthium spinosum*).
Noogoora Burr (*Xanthium pungens*).
Thornapple (*Datura ferox*).
Mintweed (*Salvia reflexa*).
Marshmallow (*Malva parviflora*).
Mustard Weed (*Sisymbrium orientale*).
Curled Dock (*Rumex crispus*).

While Bathurst Burr, Noogoora Burr and Thornapple are seldom found as impurities in wheat grain, they are often present in grain sorghums grown in the north-west. During 1945 and 1946 there was a shortage of wheat grain in this State, and this induced north-western farmers to produce

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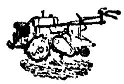

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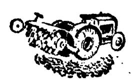

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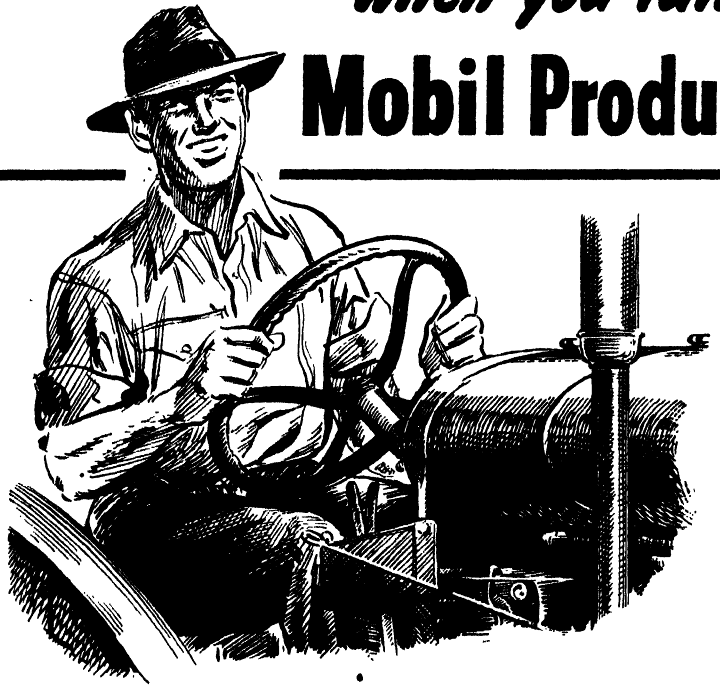

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Noogoora, or Cockle, Burr.

large quantities of grain sorghums for feeding to poultry and other stock as meal or whole grain.

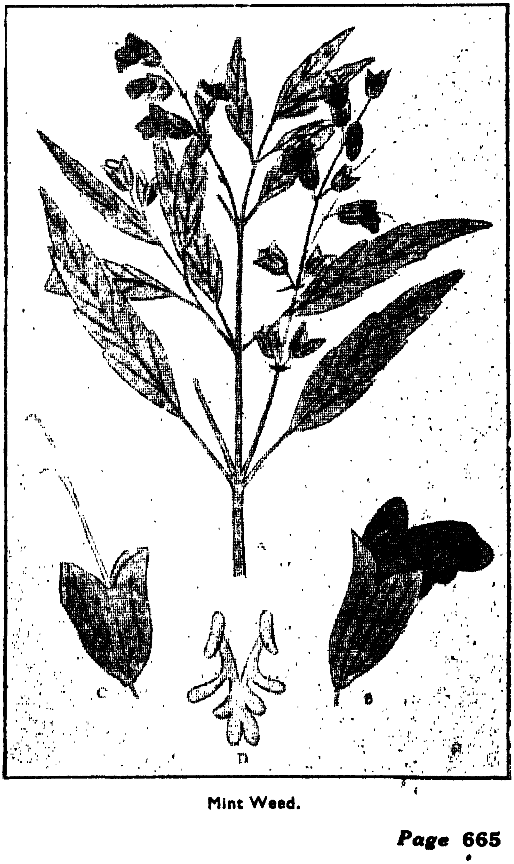
While a number of cases of poisoning have been recorded in New South Wales from stock and poultry eating green Noogoora Burr plants, there is no record of Noogoora Burr seeds or pods causing mortality in poultry, although the seeds are considered to be poisonous.

Bathurst Burr plants have caused poisoning in cattle, but there is no record of the seed being toxic to poultry. Owing to the comparatively large size of the burrs, it is unlikely that they would be eaten by the birds unless the seed pods were ground, together with the grain, and included in feeding meals.

While several species of Thornapple infest cultivation and pasture land, the two most plentiful are *Datura stramonium* and *Datura ferox*. The latter is, in most seasons, more prevalent in the north-west than *Datura stramonium* and when growing can be recognised by very long spines on its seed pods. Seeds of *Datura ferox* are suspected of causing the death of sheep held in trucking yards in Queensland, although later feeding tests with the seeds of this species at the Veterinary Research Station, Yerongpilly, Queensland, produced negative results. The green plants of *Datura stramonium* have caused considerable stock mortality in many parts of the world, and the seeds and unripe capsules have been responsible for fatalities in children. There are no records of seeds of this species having caused trouble in poultry.

Mintweed (*Salvia reflexa*) is plentiful in parts of the north-west of New South Wales and the Darling Downs, Queensland, and is a common impurity of the millets commonly grown for bird feed. Mintweed in Hungarian millet is suspected of causing mortality in cage birds in New South Wales. Although this weed has proved poisonous to stock there are no records of the seeds being detrimental to poultry.

At the Seven Hills Poultry Experiment Farm, Marshmallow (*Malva parviflora*) has always been considered a detrimental plant



Mint Weed.

to have in fowl runs. Trials in the United States of America have shown that when seeds of *Malva parviflora* were fed to hens the eggs developed what is known as "pink whites" after a period of cold storage, while eggs from the same birds before feeding the seeds remained normal.

Some of the eggs from the experiment at the Seven Hills Poultry Experiment Farm were cold stored by the Commonwealth Scientific and Industrial Research Organisation and examined after eight to ten weeks cold storage and were found to have developed pink or amber whites and custard-like yolks.

Some species of Mustard weed (*Sisymbrium* spp) grow plentifully in wheat crops, and although the seeds are very small in size, little attempt is made by many farmers to separate them from the wheat during harvesting operations; consequently some samples of grain are heavily infested with this seed. There are no records of trouble from birds eating the seeds of *Sisymbrium* spp., but some species, when eaten green by stock, are suspected of causing a bad flavour in dairy products and flesh, and one of these species, *S. orientale,* is found growing in wheat districts.

While seed of Docks (*Rumex* spp.) is not generally present in large quantities in the grains used as poultry feed, plants of *Rumex crispus* are often found in colony yards and large quantities of seed form. Seeds of *Rumex acetosella* are suspected of causing poisoning in sheep and horses, and as the seeds and other parts of a number of species of *Rumex* contain oxalic acid, this may account for the alleged poisonings.

PARTICULARS OF EXPERIMENTS.

The information gained from these experiments should be a valuable guide to those intending to purchase grain containing any of the following impurities.

Section A.

Section A of the experiment consisted of feeding separately in the mash 5 per cent. of the undermentioned finely-ground weed seeds to six first-year White Leghorn hens for a period of eleven weeks. The following results were obtained:—

BATHURST BURR (*Xanthium spinosum*).—The consumption of mash dropped by approximately 25 per cent., egg production was lowered and birds moulted earlier than with other treatments.

Portion of the Experiment Pens at the Seven Hills Poultry Experiment Farm.

While the Bathurst Burr seed did not result in any mortality, rations containing this seed could not be recommended.

NOOGOORA BURR (*Xanthium pungens*).—Food consumption did not change, but egg production was reduced. Fresh egg quality was unaffected.

THORN APPLE (*Datura ferox*).—Birds fed on seed of this weed were not affected in any way.

MINTWEED (*Salvia reflexa*).—Food consumption was somewhat higher and egg production was slightly lowered. Egg quality was not affected.

MARSHMALLOW (*Malva parviflora*).—Food consumption was normal but egg production was lowered in the group receiving this weed seed.

It is interesting to note that in the year 1947, two breeding pens of Chinese Langshans, one occupying a yard infested with

marshmallow plants and the other clear of this weed, were checked for egg production. Birds in the yard infested with seed and green material of this weed dropped in egg yield, but returned to normal egg production when the weed was eradicated, whereas no change in production was observed in the pen free of the weed.

CURLED DOCK (*Rumex crispus*).—No drop in food consumption occurred among the birds which received this weed seed in the ration, but egg production was reduced. Some fresh eggs examined showed slightly olive-coloured albumen. It would thus appear that this weed seed, while not toxic, is undesirable in the ration.

MUSTARD WEED (*Sisymbrium orientale*).—In the case of this species the consumption levels of food were unaltered and production was not affected. Fresh egg quality did not appear to deteriorate under mustard weed feeding although of six eggs examined, one had a slightly olive-coloured albumen.

Sections (B) and (C).

The following green materials were used:—

Thornapple (*Datura ferox*).

Black potato (*Solanum opacum*).

White African sorghum (*Sorghum vulgare*).

Sudan grass (*Sorghum vulgare* var. *sudanense*).

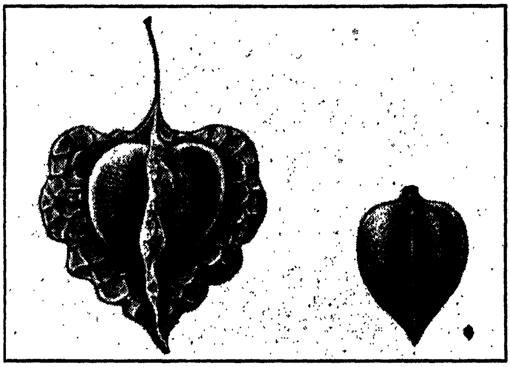
Lucerne (*Medicago sativa*).

Fresh green material was chaffed and fed each day at mid-day in galvanised iron troughs, being left in the pens until dusk. The mash hoppers were closed for one hour at mid-day to encourage the consumption of green feed.

As already stated, green plants of *Datura* may cause mortality in stock, but in this series of tests no ill effects were observed with poultry. The *Datura ferox* material emitted a strong odour at chaffing, but this was not very apparent 15 to 20 minutes later.

Solanum opacum is a common weed of coastal poultry farms. It proved somewhat unpalatable, but the birds were encouraged to eat a reasonable amount by mixing it with a little dry mash from the hoppers. The weed produced no ill effects and actually egg production was slightly increased.

As the young growth of *sorghum* and *Sudan grass* is considered to be unsatisfactory as green feed for stock, because it causes prussic acid poisoning, these two species were included in the trials to determine their effect on fowls. Neither affected the health of the birds in this trial, but egg production was lowered in the group fed Sudan grass.



A. B.

Curled Dock (*Rumex crispus*).

A.—Husk. B.—Seed.

(*Natural size seed shown at right.*)

Lucerne in flower was freshly cut each day and used for feeding the control pens in this section of the trials, the consumption averaging 1¾ ounces per bird.

Observations and Results.

Special observations made during the progress of these investigations were:—

1. The distinctive nauseating smell of Thornapple, which temporarily penetrated the mash.

2. The considerable amount of oil liberated from Mintweed seed when it was crushed, and the possibility of it going rancid.

From the results obtained in these tests, it would appear that feeding meals containing up to 5 per cent. of any of the following weed seeds, are safe to feed to fowls:—Noogoora Burr (*Xanthium pungens*), Thornapple (*Datura ferox*), Mintweed (*Salvia reflexa*), Mustard Weed (*Sisymbrium orientale*).

Agricultural Societies' Shows

SECRETARIES are invited to forward for insertion in this list dates of their forthcoming shows; these should reach the Editor, Department of Agriculture, Box 36, G.P.O., Sydney, not later than the 15th of the month previous to issue. Alteration of dates should be notified at once.

1950.

Portland	January 27, 28
Lithgow (S. J. Williams)	February 3, 4
Paterson (S. M. Reynolds)	February 9, 10, 11
Pambula	February 10, 11
Candelo	February 17, 18
Wyong (Frank Akhurst)	February 17, 18
Penrith (F. J. Cronin)	February 18
Cobargo	February 22, 23
Newcastle (P. G. Legoe)	February 22, 23, 24, 25
Rylstone—Kandos	February 24
Dorrigo (C. Coy)	February 24, 25
Bega (J. Appleby)	March 2, 3, 4
Mudgee	March 3, 4
Glen Davis (Mrs. C. A. Miller)	March 4
Gulgong	March 7
Delegate	March 8, 9
Dunedoo	March 10
Mendooran	March 13
Gundagai (J. C. Sattler)	March 14, 15
Bombala	March 15, 16
Coonabarabran (M. J. Hennessy)	March 16, 17
Cooma	March 21, 22 (or 22, 23)
Baradine	March 22
Taree (G. E. Priestly	March 22, 23
Dungog (M. Riordan)	March 24, 25
Moruya	March 24, 25
Bulahdelah (C. Wilson)	March 31, April 1
Kempsey (Central North Coast National) (L. H. Riggs)	April 20, 21, 22
Gloucester (Mrs. M. A. Newton)	April, 21, 22
Urbenville (S. Stoddart)	April 21, 22
Macksville (R. A. Napier)	April, 24, 25
Grafton (C. C. Pitt)	April, 27, 28, 29
Wagga (G. O. Dewey)	August 22, 23, 24

Approved Vegetable Seed, December, 1949.

THE growers whose names are listed below have supplies of "approved" seed of the varieties of vegetables shown against their names.

The identification number appearing after each variety has been allotted to seed from a particular crop, and all seed sold, whether wholesale or retail, from that crop must bear the number on each parcel or package. Purchasers are advised to see that all seed bought conforms with this condition.

Conditions under which names and addresses of growers of seed of recommended varieties of vegetables will be listed, as hereunder, in the *Agricultural Gazette* were published in the November, 1946, issue.

Further details of these conditions, together with application forms, are available to seed-growers from the Chief, Division of Plant Industry, Department of Agriculture, Box 36, G.P.O., Sydney.

Cauliflower—

Phenomenal Five Months (E.S. 46/2) (99 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Russian 2A (E.S. 46/1) (95 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Cauliflower—continued.

All Year Round (E.S. 47/10) (88 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Hawkesbury Solid White (E.S. 47/9) (90 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (E.S. 47/13) (89 per cent.)—E. A. Sharp, 110 Gordon-avenue, Hamilton.

Shorts (H.B. 49/5) (75 per cent.)—H. Burton Bradley, Sherwood Farm, Moorland.

Onion—

Hunter River Brown Globe (C.R. 47/11) (94 per cent.)—C. J. Rowcliff, Old Dubbo road, Dubbo.

Tomato—

Rouge de Marmande (H.R. 49/1) (90 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Red Cloud (H.R. 49/2) (97 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Marglobe (H.R. 49/3) (96 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Break O'Day (H.R. 49/4) (96 per cent.)—H. P. Richards, "Sovereignton," Tenterfield.

Hormone Weedicides Affect Banana Plants.

BANANA growers are warned that there is considerable risk attached to the use of hormone-type selective weedicides in banana plantations.

Although many weeds common to banana plantations are susceptible to the effects of synthetic hormone substances, such as 2,4-D, the banana plant itself can also be affected. Spray of such weedicides can cause serious damage if it drifts on to the stools.

Small spear-point suckers which are of the utmost importance to replace the spent stem when the bunch is cut, are particularly susceptible. Loss of these suckers is liable to upset normal development and future performance of the stool.

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Letters are coming in from Holden owners from every part of Australia. Extracts from a few of these letters are reprinted here, and they give convincing proof that Holden stands up to all the claims made for it.

"Corduroy no nightmare . . . potholes merely a nuisance."

". . . A few trips in particular are worth mentioning—Brisbane to Coolangatta, 43 m.p.g.—Brisbane to Esk with six passengers, 31 m.p.g.—and Brisbane to Gympie, 40 m.p.g. This latter trip includes 37 miles of very poor surface. The car at the present time is averaging for all types of driving 33-35 m.p.g. . . . This car's ability to dampen out the worst of roads is well worthy of mention. Corduroy is no longer a nightmare and pot-holes merely a nuisance. The seats could not be more comfortable . . . in 30 years' motoring I consider the Holden my best 'buy' and the best value offering today."

(*sgd.*) *T. V. W., Albion, Q.*

★ ★ ★

"The car will cruise all day at . . . 65-70 m.p.h."

". . . I have kept accurate records of running expenses and can only describe the economy of the car as phenomenal; petrol consumption for 6,000 miles has been 204 gallons —an average of 29.41 miles per gallon . . . More than 3,000 miles have been driven at high speed on interstate journeys and I find that the car will cruise all day at a perfectly comfortable 65 to 70 m.p.h. if required . . . I recently covered approximately 1,000 miles of severely pot-holed and corrugated road in Western N.S.W. at a steady 60/65 m.p.h. and found the comfort, dust-proofness and general road-worthiness of the car to be astounding . . ."

(*sgd.*) *K. L., Pt. Melb. Vic.*

★

"Combines all the features I require"

". . . I have owned many fine cars but have yet to own one that combines all the features I require. The Holden does this . . . its most outstanding feature is its outstanding economy which has worked out at 31 m.p.g. for all running."

(*sgd.*) *P. B. M. W., Boyup Brook, W.A.*

★ ★ ★

"Holden was the only vehicle . . . to get through"

". . . an average of 30 m.p.g. over bad roads, hilly in places, I am more than satisfied with the Holden as an all weather car. During July's heavy fall of snow the Holden was the only vehicle, including trucks, to get through from Adaminaby to Cooma when the snow was at its heaviest—approximately 8 inches in depth . . ."

(*sgd.*) *P. J. S., Adaminaby, N.S.W.*

★ ★ ★

"Used for Droving Sheep"

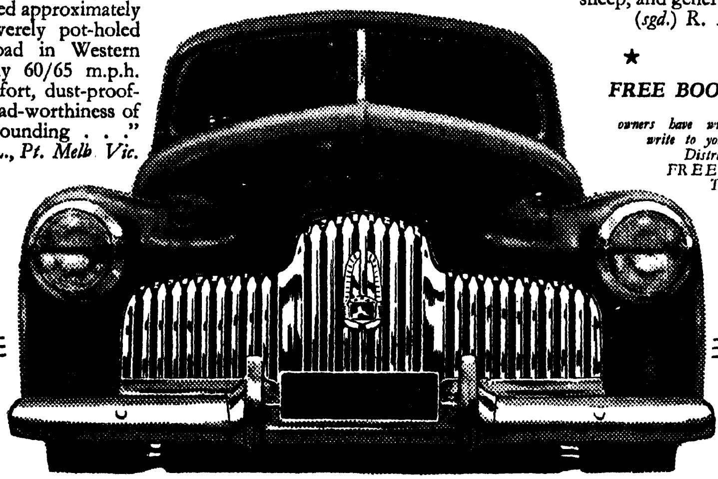
". . . I am full of praise for the outstanding performance of my Holden. The petrol consumption is remarkable as, over the whole period, I have averaged 33 miles per gallon, which on . . . occasions the car has been used for droving sheep, and general paddock work..."

(*sgd.*) *R. H. F., Kadina, S.A.*

★

FREE BOOKLET

Read the letters Holden owners have written themselves. Call or write to your nearest General Motors Distributor or Dealer for the FREE booklet—"Holden Owners Tell Their Story".



372D

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Tubercle-free Herds

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Registered Stud Herds.		
Bathurst Experiment Farm	63	11/7/50
Christian Bros. Novitiate, Mt. St. Joseph, Minto (Ayrshires)	34	27/5/50
Coote, B. N., Auburn Vale Road, Inverell (Jerseys)	113	14/8/49
Dixon, R. C., Elwatan, Castle Hill (Jerseys)	30	16/3/50
Fairbairn, C. P., Woomargama (Shorthorns)	137	1/7/50
Farm Home for Boys, Mittagong (A.I.S.)	69	10/6/50
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	44	15/6/49
Forster, N. L., Abington, Armidale (Aberdeen-Angus)	121	27/4/50
Frater, A. D., King's Plain Road, Inverell (Guernseys)	137	15/5/49
Freudenstein, W. G. A. & F. J. "Chippendale," Grenfell Road, Young (Beef Shorthorns)	56	11/5/50
Grafton Experiment Farm (Aberdeen-Angus) A.I.S.)	282	4/2/50
Hawkesbury Agricultural College, Richmond (Jerseys)	114	14/3/50
Hawkesbury Agricultural College, Richmond (Friesians)	35	14/3/50
Hurlstone Agricultural High School, Glenfield (Ayrshires)	70	22/7/50
Kahlua Pastoral Co., "Kahlua," Coolac (Aberdeen-Angus)	177	27/1/50
Killen, E. L., "Pine Park," Mumbil (Beef Shorthorns)	125	18/2/50
Limond Bros., Morisset	67	25/7/50
McGarvie Smith Animal Husbandry Farm, Liverpool (Jerseys)	90	15/7/50
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords, Jerseys)	77	22/8/51
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	79	18/6/49
New England Experiment Farm, Glen Innes (Jerseys)	36	2/5/50
New England University College, Armidale (Jerseys)	28	8/10/50
Newman, G. H., "Bunnigalore," Belanglo (Jerseys)	53	4/2/50
Peel River Land and Mineral Co., Tamworth (Poll Shorthorns)	106	29/11/50.
Perry, E. L., Shane's Park, via St. Mary's (Jerseys)	67	31/5/50
Police Boys' Club, Camp Mackay, Kurrajong (Jersey and A.I.S.)	26	1/7/50
Quickenden, P. W., "The Knoll," Bundanoon	13	11/10/50
Raper, W. R., Calool, Culcairn (Beef Shorthorns)	87	9/5/51
Ray Bros., Wellington Park, The Oaks Road Picton (Friesians and Guernseys)	231	30/8/49
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	61	2/2/50
Reid, G. T., "Narrengullen," Yass (Aberdeen-Angus)	309	16/8/50
Rowlands, F. C. "Werribee," Waugoola (Aberdeen-Angus)	38	19/8/50
Rowntree, E. S., "Mourabie," Quirindi (Jerseys)	75	25/7/51
Scott, A. W. "Milong," Young (Aberdeen-Angus)	128	9/8/50
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	198	17/10/49
The Sydney Church of England Grammar School, Moss Vale (Jerseys)	42	30/5/50
Training Farm for Boys and School of Husbandry, Berry	131	18/10/50
Trangie Experiment Farm, Trangie (Aberdeen-Angus)	190	7/2/50
Wagga Agricultural College and Experiment Station (Jerseys)	57	21/3/50
White, H. F., Bald Blair, Guyra (Aberdeen-Angus)	165	1/7/51
Wollongbar Experiment Farm (Guernseys)	126	13/9/49
Yanco Agricultural High School, Yanco (Jerseys)	64	21/5/50
Yanco Experiment Farm (Jerseys)	55	6/12/49
Young, A., "Boxlands," Burdett, via Canowindra (Beef Shorthorns)	12	11/4/51

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds.		
Andrews, G. M., "Mulla Villa" Grove, Wollombi	56	8/8/50
Australian Missionary College, Cooranbong (Jerseys)	96	19/8/49
Barnardo Farm School, Mowbray Park	48	15/7/50
Barton, S. J., "Ferndale," Appin, via Campbelltown	19	20/12/49
Brookfield Afforestation Camp, Mannus	200	20/8/49
Cagney, J. M., Yanco Creek, via Wollombi	45	15/8/50
Cameron, N., Montrose, Armidale (late New England Girls School)	41	8/10/50
Cant, R. A., Four Mile Creek, East Maitland	43	12/11/49
Colley, A. G., "Heatherbrae," Swanbrook Road, Inverell	30	28/7/51
Coote, B. N., Auburn Vale Road, Inverell	38	28/7/51
Coventry Home, Armidale	8	8/10/49
Daley, A. E., "Siton," Oakwood Rd., Inverell	13	6/6/50
Department of Education, Gosford Farm Home	29	25/2/51
Dodwell, S., Wagga	84	19/3/50
Donnelly, J., Brodie's Plains, Inverell	42	17/3/50
Emu Plains Prison Farm	138	26/4/50
Fairbridge Farm School, Molong	39	4/4/50
Forster, T. L., & Sons, "Abington," Armidale	67	27/4/50
Franciscan Fathers, Campbelltown	14	17/5/50
Frizelle, W. J., Rosentein Dairy, Inverell	102	16/8/51
Genge, G. L., Euston, Armidale	32	8/10/49
Goulburn Reformatory, Goulburn	18	31/5/50
Grant, W. S., "Monkittee," Braidwood	20	2/7/50
Hague, R. T., Balmoral, Tilbuster	35	22/2/50
Harcombe, F. C., Hillcrest Farm, Gum Flat Road, Inverell	53	1/6/51
Hunt, F. W., Spencers Gully	63	17/3/50
Ince, F., Hillgrove Road, Armidale	33	8/10/49
Ince, W. G., Kirkwood St., Armidale	16	22/2/50
Johnson, A., "Rosedale," Grafton Road, Armidale	23	8/10/49
Kenmore Mental Hospital	71	28/7/50
Koyong School, Moss Vale	2	10/6/50
Lawrence, S. A., Hillgrove Road, Armidale	20	8/10/49
Lee, H. W., and Son, Taree	49	31/10/50
Lott, J. H., "Bellevue," Rob Roy, Inverell	45	8/7/51
Lowe, W. W., Booral, via Stroud	98	10/10/50
Lucas, L., "Braeside," Armidale	27	8/10/49
Lunacy Department, Morisset Mental Hospital	60	13/9/50
Lunacy Department, Parramatta Mental Hospital	45	16/5/50
Lunacy Department, Rydalmere Mental Hospital	39	18/11/49
Lynch, G., "Glendon Grove," Wollombi	46	20/10/50
McCosker, Estate E., "Bannockburn Station," Inverell	64	8/7/50
McGrath, B. J., Clyde Rd., Braidwood	39	8/9/50
McMillan, N., Duval Road, Armidale	32	8/10/49
MacNamara, B., "Mount View," Cessnock	93	18/7/51
Marist Bros. College, Campbelltown	70	18/2/50
Mason, A., Killarney, Armidale	25	8/10/49
Morris, S. W., "Dunreath," Swanbrook Rd., Inverell	57	5/7/50
Murray, J. A., "The Willows," Keiraville	45	5/2/49
O'Brien, O., "Mount View," Inverell	34	17/3/50
Paine, R. L., "Lloloma Valley," Pringle Road, Cooranbong	7	3/6/50
Parker Bros., Hampton Court Dairy, Inverell	145	15/8/51
Peat and Milson Islands Mental Hospital	27	30/8/50
Powell, G. & Son, Loch Lomond, Armidale	18	8/10/49
Pyne, H. W., Cedar Creek, via Millfield	26	16/8/50
Rolfe, A. E., "Avon Dale," Inverell	23	8/7/50
Rolfe, C. D., "Rose Farm," Inverell	31	17/3/50
St. John of God Training Centre, Kendall Grange, Lake Macquarie	10	4/7/51
St. John's Hostel, Armidale	7	8/10/50
St. John's Orphanage, Goulburn	12	11/4/50
St. Patrick's Orphanage, Armidale	12	8/10/50
St. Vincent's Boys' Home, Westmead	27	22/8/51
State Penitentiary, Long Bay	14	27/11/49
Stephenson, W. J., "Hill View," Fig Tree	60	1/4/50

Tubercle-free Herds—*continued.*

THE following herds have been declared free of tuberculosis in accordance with the requirements of the scheme of certifying herds tubercle-free, and, unless otherwise declared, this certification remains in force until the date shown in respect of each herd :—

Owner and Address.	Number Tested.	Expiry Date.
Herds Other than Registered Stud Herds—*continued.*		
Sternbeck, P. J., Millfield	32	16/8/50
Thompson, K., Yallambi, via Wollombi ...	90	8/8/50
Tombs, E. S., Box 76, P.O., Armidale ...	36	8/10/49
Tombs, P. C., Kellys Plains, Armidale ...	42	8/10/49
Tombs, R., Harlwood, Armidale	37	[illegible]/10/49
Tosh, W. K., "Balgownie," Armidale ...	15	8/10/49
Turnbull, J. M., "Pastime," Kayuga Road, Muswellbrook	94	14/3/51
Ursuline Convent, Armidale	5	25/2/50
Von Frankenberg, F. E., "Spring Hills," Camden	61	7/12/49

Owner and Address.	Number Tested.	Expiry Date.
Waddell, W., "Afton," Oakwood Rd., Inverell	125	8/7/50
Waters, A., Marsh Street, Armidale	2	8/10/49
Watson, J. F., Golf Links Rd., Armidale ...	5	8/10/49
Weidman, A. B., No. 2 Dairy, Aberdeen Road, Muswellbrook	94	27/10/49
Weidman, A. B., No. 3 Dairy, Kayuga Road, Muswellbrook	141	18/11/50
Weidman, A. B., No. 4 Dairy, Kayuga Road, Muswellbrook	48	27/10/49
William Thompson Masonic School, Baulkham Hills	55	27/4/49
Williams, L. B., "Birida," Armidale ...	37	22/2/50
Youth Welfare Association of Australia, "Hopewood," Bowral	121	9/6/50

Tubercle-free Areas.

THE following Areas have been declared tubercle-free and no cattle are allowed to be kept therein unless subjected to the tuberculin test and found free from tuberculosis :—

Armidale Area.
Bombala Area.
Braidwood Area.
Cooma Area.
Coonamble Area.
Inverell Area.
Narrabri Area.
Municipality of Muswellbrook.
Municipality of Queanbeyan.

W. L. HINDMARSH, Chief, Division of Animal Industry.

"Cowy" Flavour in Cream.

"COWY" flavour, a common defect in cream, can be due to absorption of offensive aroma from unclean bails and yards, also to the use of milk from sick cows, and to milking cows too soon after calving.

Milk drawn during fifteen days before and five days after parturition, and in rare cases up to ten days after, should never be mixed with the remainder of the milk from a herd.

Such milk, however, is necessary for the well-being of the calf and should not be withheld from it during the first five days of its life.

Formation of a considerable clot after boiling indicates that the milk is still abnormal and unfit for human consumption, but when this clotting is replaced by the usual thin skin on boiling, the milk is in a fit condition to be included with that of the remainder of the herd.

Remedial measures for the various common defects in milk and cream are indicated in leaflets obtainable free on application to the Division of Information and Extension Services, Department of Agriculture, Box 36, G.P.O., Sydney.

Procedure for Washing Dairy Utensils.

IN washing and sterilising dairy utensils, advises a departmental pamphlet, the best results are obtained when the following routine is observed :—

1. Rinse away all milky material with lukewarm water.
2. Thoroughly scrub each utensil with a brush and water which contains soap or soda or both soap and soda. The water should be hot, but not so hot as to be uncomfortable to the hands.
3. Rinse in warm water.
4. Place in boiling water for two or three minutes.
5. Drain and place in an airy position to dry quickly.
6. A sterilising solution (preferably hypochlorite) is of considerable value if used immediately before milking if it is thoroughly rinsed away with clean water.

Brucellosis-free Herds (Cattle)

THE following herds have been declared free of brucellosis in accordance with the requirements of the scheme of certifying herds brucellosis-free :—

Owner and Address.	Number in herd.
Registered Stud Herds.	
Bathurst Experiment Farm (Ayrshires)	64
Department of Education—Farm Home for Boys, Mittagong (A.I.S.)	64
Dixon, R. C., "Elwatan," Castle Hill (Jerseys)... ...	29
Fairbairn & Co., C. P., Woomargama (Beef Shorthorns)	225
Farrer Memorial Agricultural High School, Nemingha (A.I.S.)	50
Forster, N. L., Abington, Armidale (Aberdeen-Angus)...	121
Hawkesbury Agricultural College, Richmond (Jerseys and Friesians)	112
Hicks Bros., "Meryla,' Culcairn (A.I.S.)	9
Hurlstone Agricultural High School, Glenfield (Ayrshires)	69
McEachern. H., "Nundi," Tarcutta (Red Poll)... ...	53
MacPherson, I. F., "Bloomfield," Yass (Aberdeen-Angus)	39
Murray-Wilcox, R., "Yalalunga," Willow-Tree Road, Quirindi (Herefords)	77
Mutton, T., "Jerseymead," Bolwarra, West Maitland (Jerseys)	80
New England Experiment Farm, Glen Innes (Jerseys)...	36
New England University College, Armidale (Jerseys)...	18
Peel River Land & Mineral Co., Tamworth (Beef Shorthorns)	111
Quickenden, P. W., "The Knoll," Bundanoon (Jerseys)	9
Raper, W. R., Calool, Culcairn (Beef Shorthorns) ...	87
Reid, D. B., "Evandale," Sutton Forest (Aberdeen-Angus)	52
Reid, G. T., "Narengullen," Yass (Aberdeen-Angus) ...	309
Robertson, D. H., "Turanville," Scone (Polled Beef Shorthorns)	106
Rowlands, F. C., "Werribee," Waugoola (Aberdeen-Angus)	38
Scott, A. W., "Milong," Young (Aberdeen-Angus) ...	128
Simpson, F. S., "Gunnawarra," Gulargambone (Beef Shorthorns)	182
Sydney Church of England Grammar School, Moss Vale	43
Trangie Experiment Farm, Trangie (Aberdeen-Angus)...	161
Wagga Agricultural College and Experiment Station, Wagga (Jerseys)	69
Walker, J. R., "Strathdoon," Wolsley Park	67
White, H. F., and Sons, Bald Blair, Guyra (Aberdeen-Angus)	153
Whitelaw, L. A., "Wendouree," Merriwa (Polled Beef Shorthorns)	103
Yanco Agricultural High School (Jerseys)	64
Yanco Experiment Farm	54
Young, A., "Boxlands," Burdett, via Canowindra (Polled Beef Shorthorns)	12
Herds Other than Registered Stud Herds.	
Barnes, H. J., Barker's Vale, Casino	40
Cullen-Ward, A. R., "Mani," Cumnock	32
Department of Education—Farm Home for Boys, Gosford	34
Fairbridge Farm School, Molong	32
Forster, T. L., and Sons, "Abington," Armidale ...	69
Freudenstein, W. G. A. & F. J., "Chippendale," Grenfell Rd., Young	52
Honner, A. T., Moorna Pastoral Co., Wentworth ...	27
Kenmore Mental Hospital	63
Morisset Mental Hospital	48
Mt. Penang Training School, Gosford	31
Parramatta Mental Hospital	49
Peat and Milson Islands Mental Hospital	27
Prison Farm, Emu Plains	127
Rydalmere Mental Hospital, Rydalmere	35
Salway, A. E., "Coolagalite," Cobargo	57
St. John of God Training Centre, Morisset	12
State Penitentiary, Long Bay	15
Von Nida, F. E., "Strathgarve," Wildes Meadow, via Moss Vale	32

W. L. HINDMARSH, Chief, Division of Animal Industry.

Pullorum-tested Flocks

THE following is a list of flocks which have complied with the Department's Accredited Pullorum-tested Flock Scheme, and which are tested regularly for pullorum disease:—

Name and Address of Owner.	Breeds.
Clucas & Sons, J. E., "Bellevue" Hatchery, Old Northern road, Castle Hill.	Australorps, White Leghorns, Rhode Island Reds.
Hawkesbury Agricultural College, Richmond	White Leghorns, Australorps, Langshans, Rhode Island Reds, and Turkeys.
Juniel, E., Mrs., Kings-road, Ingleburn	White Leghorns, Australorps.
Kennedy, F. J., "Kenwood," Orchard-avenue, Model Farms.	Australorps, White Leghorns.
Phippard, H. L., Bobbin Head road, Turramurra.	Rhode Island Reds, White Leghorns.
Seven Hills Poultry Experiment Farm, Seven Hills.	Australorps, White Leghorns, Chinese Langshans.
Wagga Agricultural College and Experiment Station, Bomen.	Australorps, White Leghorns.

W. L. HINDMARSH, Chief, Division of Animal Industry.

Brucellosis-free Herd Scheme (Swine)

THE following is a list of the names and addresses of owners of herds which have been declared brucellosis-free in accordance with the requirements of the Brucellosis-free Herd Scheme (Swine). The work in connection with this scheme has been undertaken as part of the general campaign against this disease and should perform a valuable service to the industry generally. Owing to the limitations of staff it will not be possible for the Department to undertake the testing of herds in general for this purpose, and in future only herds belonging to Government institutions, registered stud herds, or those containing a preponderance of registered stud animals, will be accepted for inclusion in the list. A charge will be made for the work, since the inclusion of a herd in this list should be of benefit to the owner. After a herd has been accredited, two semi-annual tests will be required, and thereafter annual tests, provided that the conditions outlined in the agreement form are strictly adhered to and that negative results are obtained at each test. So far as the elimination of the disease is concerned, apart from placing the herd on the accredited list, this work will continue as at present.

Registered Stud Herds.

Anderson, W. T. C., Dearborn Stud, Castlereagh Road, Penrith.
Bathurst Experiment Farm, Bathurst.
Boardman, C. O., " Fairview," Camden.
Campbell, D., " Hillangrove," Wamberal, via Gosford.
Draper, R. E., " Glengar," Capertee.
" Endeavour " Stud, Camp Mackay, Kurrajong.
Farrer Memorial Agricultural High School, Nemingha.
Foley, J. B., Gundurimba Road, Loftville, via Lismore.
Fraser, S. J. M., " Golf Hill," Inverell.
Grafton Experiment Farm, Grafton.
Harris, K. H., Pennant Stud Piggery, Purchase Road, West Pennant Hills.
Hawkesbury Agricultural College, Richmond.
Hurlstone Agricultural High School, Glenfield.
McCrumm, J. H., " Strathfield," Walla Walla.
Mt. Penang Training School, Gosford.
Nemingha State Hospital and Home.
New England Experiment Farm, Glen Innes.
Newington State Hospital and Home, Newington.
Police Boys' Club, Camp Mackay, Kurrajong.
Rydalmere Mental Hospital.
Shirley, G. F., " Camelot," Penrith.
Wagga Agricultural College and Experiment Station.
Walker, J. R. " Strathdoon," Wolseley Park.
White, A. N., Blakeney Stud, Orange.
Wollongbar Experiment Farm, Wollongbar.
Yanco Agricultural High School.
Yanco Experiment Farm, Yanco.

Herds Other than Registered Stud Herds.

Bathurst Gaol, Bathurst.
Brookfield Afforestation Camp, Mannus.
Callan Park Mental Hospital, Callan Park, Rozelle.
Emu Plains Prison Farm.
Glen Innes Prison Camp, Glen Innes.
Goulburn Reformatory, Goulburn.
Kenmore Mental Hospital.
Lidcombe State Hospital.
Morisset Mental Hospital, Morisset.
Orange Mental Hospital.
Parramatta Gaol, Parramatta.
Parramatta Mental Hospital.
Peat and Milson Islands Mental Hospital, Hawkesbury River.
Stockton Mental Hospital.
Waterfall Sanatorium, Waterfall.

Over-condition in Boars Must Be Avoided.

OVER-CONDITION will make a boar lazy, clumsy and impotent, and must be avoided at all costs. As a general rule, the boar's condition is the best guide as to the efficiency of his management and feeding—he must be kept in sleek, lean condition.

Boars at service should maintain their condition on 2 to 4 lb. of grain mixture per day. Some, however, may be maintained largely on green feed with a grain ration of only 1 lb., whilst others of more restless disposition may require up to 5 or 6 lb. For maximum fertility, it is important that the diet contain an ample supply of good green feed as a source of vitamin A.

It is equally important that the boar be not overworked; a good general rule is to provide one boar for each twenty sows and to regulate services in such a way as to permit not more than two matings a week.

A young boar, when first brought into service (preferably at nine months of age) requires special care. As he is still growing rapidly, the grain ration should be larger than for the average adult boar, and can be increased to 5 to 6 lb. safely. Under no circumstances should a young boar be overworked; in his first year of stud work he should not be given more than one service a fortnight at most.—DIVISION OF ANIMAL INDUSTRY.

Hatching Eggs to Tasmania—Export Regulations Amended.

TASMANIAN regulations in connection with the conditions under which eggs for hatching can be consigned to that State have been amended recently.

Eggs for hatching must now be accompanied by a certificate issued by a government Veterinary Officer or Stock Inspector. This certificate must be to the effect that the adult fowls from which the eggs were taken have given a negative reaction to the agglutination test for pullorum disease, within a period of thirty days prior to the eggs being exported to Tasmania.

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